SUPPLEMENTAL INVESTIGATION WORK PLAN

Former Sylvania Electric Products Incorporated Facility
Cantiague Rock Road
Hicksville, New York

GTE Operations Support Incorporated

June 2000 (revised September 2000)

O'BRIEN & GERE
ENGINEERS, INC.

A-86

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1. Introduction

This document presents a Supplement to the approved Voluntary Investigation Work Plan for the investigation of the former Sylvania Electric Products Incorporated (Sylvania) facility, at 70, 100, and 140 Cantiague Rock Road in Hicksville, New York (Figure 1) (the Site). The plan was prepared by O'Brien & Gere Engineers, Inc. (O'Brien & Gere) on behalf of GTE Operations Support Incorporated (GTEOSI) on a voluntary basis, in cooperation with New York State Department of Environmental Conservation (NYSDEC). The initial Work Plan was accepted in March 1998 (revised May 1998) and was implemented during the summer of 1999. An investigative report presenting the results of initial Site activities was issued on January 7, 2000 (revised August 2000). Upon acceptance by NYSDEC, this plan will be considered a supplement to Exhibit B of the Voluntary Cleanup Program (VCP) agreement between GTEOSI and NYSDEC.

The Site currently consists of three properties. Air Techniques, Incorporated, a manufacturer of small air compressors, vacuum pumps, video cameras and x-ray processing equipment for the dental industry occupies the property at 70 Cantiague Rock Road. Magazine Distributors, Incorporated (Magazine Distributors), which is owned by Harbour Distributors, is at 100 Cantiague Rock Road. Magazine Distributors loads and sorts magazines for distribution. Gilbert Displays, Incorporated (Gilbert Displays) 140 Cantiague Rock Road, manufactures displays for a variety of clients. The Gilbert Displays parcel was purchased by GTEOSI in the fall of 1999 and will be vacated in September 2000.

The purpose of this plan is to outline supplemental activities designed to further investigate select areas containing process residuals, including radionuclides, metals, and solvents reported to have been used by GTEOSI's predecessor companies and provide supplemental data to bring closure to several Site areas. This plan incorporates the issues from:

1) Comments provided by NYSDEC Region 1 and NYSDEC Bureau of Radiation and Hazardous Site Management, Albany in a letter dated March 22, 2000 from Robert Stewart to Jeffrey Banikowski (Project Manager), O'Brien & Gere.

2) Comments from New York State Department of Health (NYSDOH), Bureau of Environmental Exposure Investigation (May 11, 2000 letter) and Bureau of Environmental Radiation Protection (May 3, 2000 letter), Albany provided in a letter received May 22, 2000 (via fax on May 11, 2000) from Robert Stewart, NYSDEC to Alvin Ludwig, GTEOSI.

3) Comments provided by NYSDEC Region 1 (dated August 4, 2000) and NYSDEC, Bureau of Radiation and Hazardous Site Management, Albany (dated August 1, 2000) in a letter dated August 4, 2000 from Robert Stewart to Alvin Ludwig, GTEOSI.

4) Discussions held during an August 9, 2000 meeting at the NYSDEC Regional Headquarters in Albany, New York. The meeting was attended by representatives of NYSDEC, NYSDOH, O'Brien Gere, and GTEOSI.

This plan is divided into the following chapters.

1. Introduction - introduces the reviewer to the Site including project objectives, approach, scoping and general Site information;

2. Field investigation - summarizes those activities that will be performed to further investigate and delineate impacted areas;

3. Report Preparation;

4. Project Organization; and

5. Schedule - outlines the schedule for implementation of the Supplement to the approved Work Plan.

1.1. Project objectives

The following project objectives and methods to accomplish these objectives have been established for the investigation and are provided below:

- Further define the vertical and lateral extent of residual levels of radionuclides by advancing 11 soil borings on the Air Techniques property around SB-002, SB-003 and SB-005 (Figure 2);

- Delineate areas of impacted soil on the east side of Gilbert Displays and beneath the building and provide Site geotechnical information, eighteen borings will be advanced through the building floor. Two of the borings will be advanced adjacent to the historic leaching pools mentioned in the Departments March 22, 2000 letter;

- Evaluate historic leaching pools LP-4, LP-7, and LP-8 and potential subsurface impacts from these leaching pools, three soil borings will be advanced through the Magazine Distributors floor;

- Assess potential reservoir overflows or other adjacent impacts, three borings will be advanced southeast of the reservoir on the east side of Magazine Distributors (near SB-064, SB-094, and SB-095);

- Evaluate the historic leaching pool on the south side of Magazine Distributors, southeast of SB-091 (NYSDEC LP-13), one boring will be advanced; and

- To assess areas not yet determined, up to five additional soil borings may be advanced depending on field conditions encountered. Locations will be determined in the field.

Additional objectives, descriptions, and justifications for exploratory borings agreed upon during the August 9, 2000 meeting include:

- View the possible sediment layer(s) and potential subsurface impacts from former leaching pools LP-9 and LP-10, two borings will be advanced at SB-75 and SB-76. These borings will be pushed directly to 20 feet below land surface (bls). A high soil gas reading was observed at SB-75 during the former investigative activities;

- Evaluate areas potentially impacted by nickel, three borings will be advanced on the perimeter of SB-74 where elevated levels of metals were observed and one boring will be advanced east of and between SB-77 and SB-82;

- Define area of high PID reading with depth, two borings, SB-83 and SB-85 (AOC 11 and 12), will be advanced;

- View and assess the possible "sediment layer" and potential subsurface impacts from the former leaching pools LP-14 and LP-15, two borings will be advanced to 20 feet bls. Samples will be collected at both shallow and deep intervals (4 feet and 20 feet);

- Gauge concentrations of metals and polychlorinated biphenyls (PCBs) in both the shallow and deep soil layers, one soil boring will be advanced near SB-79; and

- Evaluate the concentrations of PCBs in the shallow soils. Two shallow borings (approximately 4 feet bls) will be advanced near the electrical transformers on the south side of Magazine Distributors and one shallow boring will be advanced near SB-81.

Finally, three air samples and one water sample will be collected. The air samples will be collected from the inside of Gilbert Displays to evaluate the concentrations of PCE and TCE in the ambient air. The water sample will be collected from MW-01 to verify the concentration of nickel previously detected. More information on sampling locations and procedures are in the Field Sampling Plan (FSP) (Appendix B).

In conjunction with meeting the goals and intent of New York State's VCP, the supplemental investigation has been designed to achieve these objectives in a manner consistent with the National Contingency Plan (40 CFR Part 300) and in recognition of regulatory guidance that has been developed to assess environmental conditions associated with sites of this type. This regulatory guidance includes, but is not limited to, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA - Interim Final (USEPA 1988), applicable portions of 6 NYCRR Parts 370 to 376 and 6 NYCRR parts 380 and 381.

1.2. Project approach

The supplemental areas of investigation were defined based on the results of the samples collected during the initial soil and ground water investigation and at the request of NYSDEC personnel. The supplemental samples will be collected to further delineate the vertical and lateral extent of the areas indicated in Section 1.1. The selected approach assumes access to the properties currently comprising the Site can be obtained. If access difficulties are encountered, the investigative approach and schedule to implement the Supplemental Work Plan activities may require modification.

1.3. Project scoping

The initial project scoping and field activities focused primarily on data gathering. This supplemental investigation uses the data previously collected to further define the nature and extent of compounds detected.

- Site Visit – A Site visit was performed in April 2000 to evaluate the possible methods and feasibility of drilling through the floors at Gilbert Displays and Magazine Distributors and to review the proposed supplemental locations in relation to traffic routes and health and safety concerns.

- Background documentation - Site information regarding previous Site investigations and activities was originally provided to NYSDEC personnel by the Nuclear Regulatory Commission (NRC) and subsequently to GTEOSI. The NRC information substantiated the use of uranium at the Site, and provided a limited historical perspective on facility manufacturing processes.

- Previous soil and ground water investigation - In July and August 1999 a soil and ground water investigation was conducted at the Site and surrounding properties to evaluate the nature and extent of residual radionuclides (uranium and thorium) and solvents. The results of these efforts were presented in the *Investigative Report* dated January 2000, revised August 2000 (O'Brien & Gere 2000).

- Follow-up telephone conversations, written correspondence and a meeting with NYSDEC were held to obtain their perspective on applicable investigative and analytical methodologies.

1.4. Current Site and area usage

The Site is in west central Long Island, approximately one-mile west of Hicksville, New York (Figure 1). Historically, the Site was comprised of Lots 79 and 80 containing three main buildings (designated as buildings 1, 2, and 4) used to fabricate reactor fuel elements and twelve support buildings. With the exception of a portion of building 4, which now houses Air Techniques, Inc., the Site buildings were demolished prior to 1970. The property was subdivided into three new parcels with new lot numbers.

The current Site is comprised of three buildings: Air Techniques, Inc. (70 Cantiague Road), Magazine Distributors Inc. (100 Cantiague Road), and Gilbert Displays, Inc. (140 Cantiague Rock Road). Approximately 95 percent of the 9.5-acre Site is either paved or occupied by buildings and has little topographic relief. The Nassau County Parks Department (Cantiague Park) golf course driving range is not part of the Site, but was studied concurrently with the investigation study areas at the request of NYSDEC.

Based on Site reports, as well as a Site visit by O'Brien & Gere and GTEOSI personnel, land use on-Site and directly to the north, west and south is a mix of commercial and industrial businesses. The Site, which is fenced, is bounded by the Nassau County Parks Department golf course driving range to the east, Cantiague Rock Road to the west, General Semiconductor to the south and the Nassau County Department of Public Works (DPW) to the north. It should be noted that the General Semiconductor facility (former General Instruments) has reportedly been purchased by First Industrial Realty, Syosset, New York. However, for clarity and consistency, the name General Semiconductor has been retained in this Work Plan.

Gilbert Displays, on the north side of the Site (attached figure) and immediately south of the Nassau County DPW, is a 54,500 square feet one-story office and industrial building reported to have been constructed in 1968. This building has been purchased by GTEOSI and will be vacated by Gilbert Displays in September 2000. Magazine Distributors, which is 79,200 square feet, is centrally located on the Site and consists of a commercial building bounded by parking lots on all sides. Air Techniques Inc., on the south side of the Site, consists of an approximately 210,000 square foot one-story brick building. This property (Lot 94) was purchased by Air Techniques in 1979, and was expanded to the east after an adjacent lot (Lot 105) was purchased from Nassau County (ERM 1997).

1.5. Ground water and soil radionuclides

In the summer 1999, over 100 borings were advanced at the Site. Samples of both soil and ground water were screened in the field using field instrumentation and analyzed by O'Brien & Gere Laboratories, Inc. for radionuclides, metals, PCBs, volatile organic compounds (VOCs), and semi volatile organic compounds (SVOCs). Findings suggest that there are isolated areas of above background radiation on each of the properties investigated (O'Brien & Gere 2000). However, no immediate health hazard exists given that exposures are well within referenced acceptable levels. Except for some exposed surface soils at the rear of Gilbert Displays and Magazine Distributors, soils with above background levels of radionuclides are beneath pavement or occur several feet bls. Radionuclides in soils at the Nassau County Parks Department golf course driving range are confined to two small areas adjacent to the fence at the eastern Site property line. Tetrachloroethylene (PCE) and trichloroethylene (TCE), common solvents, were found to exist in several subsurface locations at the rear of Gilbert Displays and Magazine Distributors as well as in the ground water.

2. Field investigation

Review of available information and conversations with NYSDEC personnel suggest that additional investigation is necessary to: further define areas where radiation levels in soils above background levels have been detected, assess the soils beneath the building, evaluate former leaching pools, delineate areas containing metals, and collect additional soil data in select areas. Field activities will be performed in a staged progression, with one task determining the need for and extent of the succeeding task. The soil borings are assumed to take about twelve days to complete.

The proposed supplemental investigation is briefly presented in the task descriptions within this chapter. The health and safety plan (HASP) is presented as Appendix A. Specific field sampling procedures to be used during the implementation of Site activities are included in the FSP attached as Appendix B. In addition, quality assurance/quality control (QA/QC) procedures were presented in the Quality Assurance Project Plan (QAPP), Appendix C. Key Project individual resumes not previously accepted by NYSDEC are provided as Appendix D.

2.1. Task 1: Project planning

Project planning is an on-going task. Planning activities will include meeting with NYSDEC personnel, meetings with property owners to discuss the proposed scope of work, and preparation of appropriate subcontracts and plans. The purpose of the meeting with NYSDEC personnel will be to address any questions that the department may have regarding the scope of work and finalize on understanding regarding its implementation.

2.2. Task 2: Mobilization

Site preparation activities will be initiated prior to field activities. Preparation activities include mobilization of support facilities and equipment and notifying current property owners and NYSDEC of planned activities. O'Brien & Gere personal will log soil cores, perform appropriate field-testing including scanning cores for radioactivity, collect analytical samples and interface with NYSDEC personnel and property owners as necessary on behalf of GTEOSI. In order to perform this task, O'Brien & Gere will mobilize equipment that was approved in the initial Work Plan and used during previous investigation activities.

NYSDEC and current property owners will be notified approximately one week prior to the commencement of field activities, unless field conditions dictate otherwise. In this case, NYSDEC as well as current property owners will be informed as soon as the activity is scheduled, but before it is implemented.

2.3. Task 3: Survey

A survey to locate and map utilities and soil borings will be performed by a surveyor licensed in the State of New York. The survey will be conducted prior to drilling activities, if possible. Elevations at the monitoring wells and former temporary well points will be measured, if possible and the elevation data will be useful in evaluating ground water flow direction.

2.4. Task 4: Supplemental investigation

The supplemental investigation will consist of the advancement of approximately 55 soil borings and six monitoring wells (Figure 2). Eleven borings will be used to further delineate (both laterally and vertically) the areas around SB-002, SB-003, and SB-005. Three soil borings will be advanced near SB-064 for the purpose of further investigation/delineation. Approximately 18 soil borings will be advanced through the floor of Gilbert Displays to delineate areas of impacted soil on the east side of Gilbert Displays, beneath the building, and adjacent to the historic leaching pools. Three soil borings will be advanced through the Magazine Distributors floor near historic leaching pool locations, if possible. One boring will be advanced on the south side of Magazine Distributors, southeast of SB-091, near an historic leaching pool (NYSDEC LP-13).

Additionally, three borings will be advanced southeast of the reservoir on the east side of Magazine Distributors (near SB-064, SB-094, and SB-095) to assess potential reservoir overflows or other adjacent impacts. Four borings will be advanced to view the possible sediment layer(s) and potential subsurface impacts from former leaching pools LP-9, LP-10, LP-14 and LP-15. Three borings will be advanced on the perimeter of SB-74 to evaluate areas potentially impacted by nickel. Two borings will be advanced near SB-83 and SB-85 to define area of high PID reading with depth. Four soil borings will be advanced to gauge concentrations of metals and PCBs. Two of the borings will be advanced near the electrical transformers on the south side of Magazine Distributors and one boring each will be advanced near SB-79 and SB-81. Additional soil borings may be advanced depending on field conditions encountered. Exact boring locations will be determined in the field.

A diamond hole saw will be used to bore through the 10-inches thick concrete floor. The soil vapor beneath the building will be scanned prior to probing into the subsurface for health and safety purposes. At other locations, a soil vapor sample will be collected at 5 feet bls to screen for the presence of VOCs on a preliminary basis. Soil vapor results will indicate potential health and safety concerns for field workers, provide Site wide soil vapor levels, and aid in the selection of additional soil boring locations, if applicable.

Continuous soil cores will be collected from each boring location. The cores will be obtained using direct push methodologies such as a truck mounted Geoprobe®. The soil cores will be screened for radioactivity and VOCs and applicable soil samples will be collected. The borings will be advanced to at least 20 feet near the historic leaching pools, if possible. If elevated concentrations of contaminants continue to be observed with field instruments at depth, the soil boring will be advanced deeper, if feasible. Boring depths will be dependent upon field findings and may range from approximately 4 feet to 40 feet bls. Borings will be terminated when refusal is encountered with a 1-inch diameter soil core with the Hurricane drill rig or a rig with similar drilling capacity or when concentrations of contaminants are decreasing with depth. Geotechnical blow counts may be taken in some of the borings at the discretion of the Project Manger. The geotechnical testing would be outside the scope of this investigation. Specific field procedures and drilling and sampling methodologies are presented in the FSP.

Ground water investigation

One round of ground water field measurements (pH, conductivity, turbidity, and temperature) and depth-to-water measurements will be conducted at the site to corroborate previous results and update site ground water maps. Measurements will be collected from the five monitoring wells located on the Site and three remaining monitoring wells upgradient of the facility on the DPW property. In addition, one ground water sample will be collected from MW-1 to verify the concentrations of nickel in the ground water.

Six monitoring wells will be advanced using Rotosonic® drilling techniques to evaluate ground water quality conditions in areas not monitored by the existing monitoring well network. This drilling method uses an oscillating drill head to quickly advance through the subsurface generating minimal cuttings.

2.5. Task 5: Restoration of surfaces

Advancing soil borings using a Geoprobe® sampling device provides very limited disruption to the ground surface. All exterior borings placed

3. Report preparation

An Interim Technical Memorandum (ITM) was completed in March 1998 and was included as Exhibit A in the March 1998 Work Plan. Monthly progress reports continue to be issued as outlined in Section II of the VCP Agreement. The *Final Investigative Report* (OBG 2000), presenting the results and the conclusions of the investigation, was submitted to NYSDEC and other involved regulatory agencies in January 2000 (revised August 2000). A Supplemental Report will be submitted following the commencement of this work. The supplemental information will include:

- an updated Site map
- supplemental field investigation results
- supplemental laboratory analysis
- conclusions of the investigation

This information is intended to supplement the *Final Investigative Report* (OBG 2000).

4. Project organization

Key project individuals and lines of communication are shown in the organization chart (Figure 3). Resumes not previously provided to and approved by NYSDEC (May 11, 1998) are included as Appendix D.

GTE Operations Support Incorporated

O'Brien & Gere will report to Alvin Ludwig, GTEOSI Vice President, Controller, throughout the investigation and act at his direction. Mr. Ludwig will perform the following:

- obtain access agreements from current Site owners;
- provide comments on draft reports and approve final project reports;
- act as the primary interface with NYSDEC;
- approve changes to the scope of work and schedule; and
- administer the overall project on behalf of GTEOSI.

O'Brien & Gere will support Mr. Ludwig in the performance of the above activities at his discretion. Ms. Jean Agostinelli, GTEOSI, will assist Mr. Ludwig. In turn, O'Brien & Gere will report to Ms. Agostinelli in Mr. Ludwig's absence and at his direction.

Project Officer

Swiatoslav W. Kaczmar, Ph.D., CIH, will act as Project Officer on behalf of O'Brien & Gere. As Project Officer, it is Dr. Kaczmar's responsibility to participate in project planning and design, review, approve, and sign any reports issued by O'Brien & Gere, certify that work was performed in accordance with the Work Plan, allocate staff and other resources to the project, and review and administer subcontracts.

Project Manager

Jeffrey E. Banikowski, CPG, LSP, will act as Project Manager. As Project Manager, Mr. Banikowski will have responsibility for the implementation and completion of each of the tasks identified in the Work Plan. Mr. Banikowski will manage the technical and administrative aspects of the project, function as the firm's principal client contact, and interface with regulatory agencies at GTEOSI's direction. The data management, data validation, and geographic information system support team will also report directly to Mr. Banikowski throughout the project.

Field Operations Supervisor

Ms. Pam Cox will act as Field Operations Supervisor. As Field Operations Supervisor, Ms. Cox will be responsible for day to day field operations including overseeing soil coring operations, sample collections, mobilization, demobilization activities, and overall in-field coordination with subcontractors, regulatory agencies, and property owners. Ms. Cox will also assist Mr. Banikowski in applicable Project Manager tasks.

Radiation Safety Officer/Industrial Hygienist/Risk Assessor

Thomas Lavoy, CHP, will act as project Radiation Safety Officer. Mr. Lavoy's responsibilities include: oversight of radiation health and safety, review and interpretation of sample analyses related to radionuclides train and provide technical knowledge on radiation equipment and represent GTEOSI in matters of radiation and health physics. Mr. Lavoy will report to the Project Manager. If necessary, Mr. David Wilson, CIH, will be available to assist Mr. Lavoy in the performance of his duties relative to an indoor radiation survey.

Site Safety and Health Coordinator

A Site Safety and Health Coordinator (SSHC) will be assigned to the project to implement a Health and Safety Plan (Appendix A). The SSHC will report to the Project Manager and Radiation Safety Officer. The SSHC will conduct daily health and safety briefings with Site workers, review health and safety procedures prior to each days work activities, review decontamination protocols, perform air monitoring for health and safety purposes, and maintain health and safety records. The SSHC will also assist the Field Operations Supervisor.

5. Schedule

The supplemental investigation is planned for October 2000 (Figure 4). The schedule assumes the Supplement to the approved Work Plan will be reviewed and agreed upon by the NYSDEC and NYSDOH and that access to the Site can be achieved in a timely fashion. The schedule has been developed in the belief that it is in the best interests of both GTEOSI and New York State to investigate the Site to the extent of GTEOSI's involvement as expeditiously as possible. For this reason, GTEOSI offers this schedule for regulatory examination and barring any unforeseen circumstances that would cause delay, commits to its implementation.

References

ERM, Northeast. 1997. Summary Report of Ground Water Monitoring Program - Air Techniques Facility.

GTE Operations Support Incorporated (GTEOSI). 1996. Data Supplied by GTEOSI. Former Sylvania Site, Hicksville, New York.

New York State Department of Environmental Conservation (NYSDEC). 1997. Region 1: Robert Stewart.; Personal Communications regarding Hicksville, New York. March 1997.

O'Brien & Gere (OBG) Engineers, Inc. 2000. *Final Investigative Report Former Sylvania Electric Products, Inc. Facility, Hicksville, New York.* January 2000 (revised August 2000).

United State Environmental Protection Agency (USEPA). 1988. Interim Final - Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.

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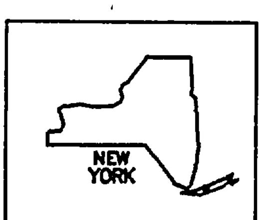
FIGURE 1

SOURCE: USGS 7.5 MINUTES HICKSVILLE QUADRANGLE MAP, 1967.



STATE LOCATION MAP

GTE OPERATIONS SUPPORT INCORPORATED
FORMER SYLVANIA ELECTRIC PRODUCTS
INCORPORATED FACILITY
HICKSVILLE, NEW YORK

SITE LOCATION MAP

4000 0 4000

1"=4000'

5816.001.701

DEC. 1999

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THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: FIGURE 2, "SUPPLEMENTAL INVESTIGATION SOIL BORING LOCATIONS"

WITHIN THIS PACKAGE

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Figure 3
Project Organization Chart

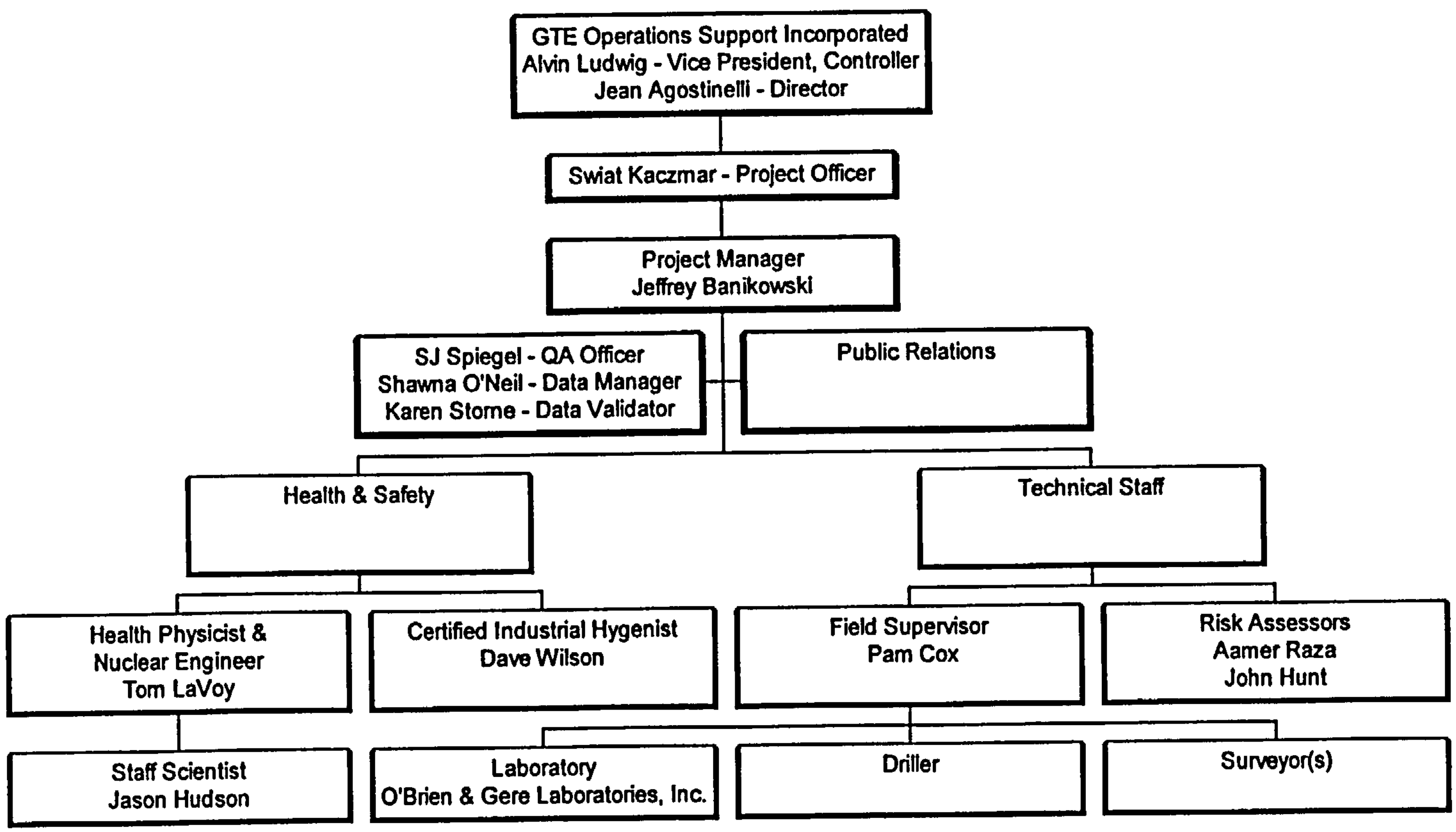

Figure 4
GTE Operation Support Incorporated: Tentative Schedule
Former Sylvania Electric Products Incorporated Facility
Hicksville, New York

	7/31	8/7	8/14	8/21	8/28	9/4	9/11	9/18	9/25	10/2	10/9	10/16	10/23	10/30	11/6	11/13	11/20	11/27
Supplemental Investigatory Work Plan Preparation																		
NYSDEC Comments on Work Plan																		
Response to NYSDEC Comments																		
Acceptance of Supplemental Plan																		
Preparation for Field Work																		
Mobilization																		
Site Survey																		
Suuplemental Field Investigation																		
Sample Analysis																		
QA/QC Summary Report																		
Soils Investigation Report Preparation																		
NYSDEC Review																		
Preparation for Field Work																		
Mobilization																		
Monitoring Well Installation																		

Figure 4
GTE Operation Support Incorporated: Tentative Schedule
Former Sylvania Electric Products Incorporated Facility
Hicksville, New York

	12/4	12/11	12/18	12/25	1/1	1/8	1/15	1/22	1/29	2/5	2/12	2/19	2/26	3/5	3/12	3/19	3/26	4/2
Supplemental Investigatory Work Plan Preparation																		
NYSDEC Comments on Work Plan																		
Response to NYSDEC Comments																		
Acceptance of Supplemental Plan																		
Preparation for Field Work																		
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Soils Investigation Report Preparation																		
NYSDEC Review																		
Preparation for Field Work																		
Mobilization																		
Monitoring Well Installation																		

Figure 4

GTE Operation Support Incorporated: Tentative Schedule
Former Sylvania Electric Products Incorporated Facility
Hicksville, New York

	4/9	4/16	4/23	4/30	5/7	5/14	5/21	5/28	6/4	6/11	6/18	6/25	7/2	7/9	7/16	7/23	7/30
Supplemental Investigatory Work Plan Preparation																	
NYSDEC Comments on Work Plan																	
Response to NYSDEC Comments																	
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Soils Investigation Report Preparation																	
NYSDEC Review																	
Preparation for Field Work																	
Mobilization																	
Monitoring Well Installation																	

APPENDIX A

Health & Safety Plan

HEALTH AND SAFETY PLAN

Former Sylvania Electric Products Incorporated Facility Cantiague Rock Road Hicksville, New York

GTE Operations Support Incorporated

May 2000 (Revised August 2000)

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1. Introduction

1.1. General

This Health and Safety Plan (HASP) has been developed to provide general procedures to be followed by personnel while performing work at the former Sylvania Electric Products Incorporated facility in Hicksville, New York (the Site).

This HASP describes the minimum responsibilities, training requirements, protective equipment, and standard operating procedures to be used to address potential health and safety hazards while in construction areas. This plan specifies procedures and equipment to be used during work activities and emergency response to minimize exposures of personnel to hazardous materials. The selection of protective equipment is in accordance with the Code of Federal Regulations (CFR) 29 CFR 1910.32.

Although this HASP can be made available to interested persons for informational purposes, GTE Operations Support Incorporated (GTEOSI) does not assume responsibility for the interpretations or activities of any persons or entities other than employees and contractors of GTEOSI.

1.2. Site background

The former Sylvania facility is located at 70-140 Cantiague Rock Road, Hicksville, New York in Section 11, Block 499, and Lots 94, 99, and 100 of the Nassau County Land and Tax Maps. GTEOSI's predecessor companies in interest operated processing units at this facility from approximately 1952 until 1966. These companies fabricated fuel element plates for various customers. The fabrication process included melting, shearing, punching, pressing, welding, heating, brazing, machining, powder blending, sintering, and chemical cleaning and milling.

1.3. Implementation of the HASP

The requirements and guidelines presented in this HASP are based on information contained in a variety of Site historical reports referenced in the Work Plan dated March 1998 and revised May 1998. This HASP incorporates by reference the applicable Occupational Safety and Health Administration (OSHA) requirements in 29 CFR Part 1910 and 29 CFR Part 1926. This HASP will be available for inspection and review by Site workers and regulatory personnel while work activities are underway. Site workers are required to comply with this HASP when conducting the Site activities listed in the Work Plan. Site workers will notify the GTEOSI Representative or the Site Safety and Health Coordinator (SSHC) of matters of health and safety. The SSHC is responsible for informing the Project Manager and Radiation Safety Officer of monitoring activities, monitoring compliance with the provisions of this HASP, and for modifying this HASP to the extent necessary if Site conditions change.

Non-intrusive activities: Non-intrusive activities within the Contractor's scope of work are those that do not have the potential to jeopardize the health and safety of Site workers, the public, or the environment with respect to Site related process residuals. Hazardous waste operations training per 29 CFR 1926.65 is not required. However, all other applicable health and safety regulations, GTEOSI requirements, and HASP requirements must be followed.

Intrusive activities: Intrusive activities within the Contractor's scope of work are those which have the potential to cause health and safety concerns to Site workers, the public, or the environment. These activities and any non-intrusive activities conducted in an Exclusion Zone require training per 29 CFR 1926.65 for potential chemical hazards.

This HASP is specifically intended for GTEOSI's personnel and contractors who will be conducting activities within the defined scope of work in specified areas of the Site. For the purposes of this HASP, the Contractor is defined as the engineering firm who will perform work on-Site under contract to GTEOSI. The Contractor will inform Site personnel, subcontractors, and visitors of potential safety and health hazards and the contents of this HASP. The above persons are responsible for complying with regulations, GTEOSI policies, and provisions of this HASP applicable to the work that they are performing. This HASP may be provided to interested parties for informational purposes; however, the HASP is specifically intended for the conduct of activities within the scope of work of the Contractor.

Future actions that may be conducted at this Site and unexpected conditions that may be encountered may necessitate the modification of the requirements of this HASP. The SSHC will recommend modifications to the HASP. The Contractor's Project Manager will have responsibility for approving them. Modifications to this HASP shall be outlined on the *Revision Summary* page.

1.4. Project organization

All personnel involved in the activities at the Site implicitly have a part in implementing the HASP. Among them, the contractors Project Officer, Project Manager, Field Supervisor, SSHC, and radiation safety officer have specifically designated responsibilities. Their names and telephone numbers are listed in Table 1-1.

Key project personnel and their responsibilities are discussed below.

Project officer: The Project Officer is responsible for the overall administration and technical execution of the project. The Project Officer is further responsible for the acquisition and delegation of resources necessary for project completion and HASP implementation.

Project manager: The Project Manager reports to the Project Officer and is directly responsible for the technical progress and financial control of the project.

Field supervisor: The Field Supervisor is responsible for coordinating the project field requirements, overseeing daily activities of the project and implementing health and safety requirements in the field. The Field Supervisor is also responsible for conducting periodic safety inspections independent of the SSHC and correcting observed deficiencies on this Site.

Site safety and health coordinator (SSHC): The SSHC for Site workers reports to the Project Manager, coordinates and establishes operating standards and coordinates overall project safety and health activities for the Site. The SSHC reviews project plans and revisions to plans to determine that safety and health procedures are maintained throughout the investigation. The SSHC audits the effectiveness of the HASP on a continuing basis and suggests changes, if necessary, to the Project Manager. In matters of health physics, the SSHC will consult with the Radiation Safety Officer.

Specifically, the SSHC is responsible for the following actions:

- Provide a complete copy of the HASP at the Site before the start of activities;
- Familiarizing workers with the HASP;
- Conducting on-Site health and safety training and briefing sessions;

- Documenting the availability, use, and maintenance of personal protective and other safety or health equipment;

- Maintaining safety awareness among Site workers and communicating safety and health matters to them;

- Reviewing field activities for performance in a manner consistent with contractor policy and this HASP;

- Monitoring health and safety conditions during field activities;

- Coordinating with emergency response personnel and medical support facilities;

- Notifying the Project Manager of the need to initiate corrective actions in the event of an emergency, an accident, identification of a potentially unsafe condition, encountering a health or safety problem, or identification of an exception to this HASP;

- Recommending improvements in safety and health measures to the Project Manager;

- Conducting safety and health performance and system audits;

- Selection and inspection of personal protective equipment (PPE);

- Ensuring that the daily Health and Safety Log is available for review when requested by a GTEOSI Representative; and

- Forwarding all accident/emergency reports to the GTEOSI Representative within 24 hours.

The SSHC has the authority to recommend that the Project Manager take the following actions:

- Suspend field activities or otherwise limit exposures if the health or safety of any Site worker appears to be endangered;

- Notify Site workers to alter work practices that the SSHC deems to not protect them; and

- Suspend a Site worker from field activities for violating the requirements of this HASP.

Radiation safety officer (RSO): The RSO will report directly to the Project Manager and will be available to answer questions regarding health physics issues. Any unusual conditions encountered during invasive field activities will require radiological monitoring coordinated by the Site RSO.

Table 1-1 *Project personnel*

Name and title	*Telephone*
Swiatoslav Kaczmar, Project Officer	315-437-6100
Jeffrey Banikowski, Project Manager	315-437-6100
Pam Cox, Field Supervisor	315-437-6100
Jason Hudson, Site Safety and Health Coordinator	315-437-6100
Tom LaVoy, Radiation Safety Officer	315-437-6100

2. Hazard analysis

2.1. Potential exposures

The SSHC is responsible for administering the Contractor's Hazard Communication Program. This Hazard Communication Program will document that Site workers are informed about the hazards associated with chemicals used on the job per OSHA HAZWOPER standards (29 CFR 1910.120 and 1926.65) and the location of the material safety data sheets (MSDS) for materials brought on-Site. Health hazard information for Site chemical hazards is summarized below and in Table 2.1. Table 2.2 lists the highest and average concentrations of various compounds and radioisotopes that have been detected in Sites soil and ground water. (Note: the highest concentrations of these materials are in confined areas of the Site). The MSDS forms for hazardous materials brought on Site will be in the Contractor's trailer or other suitable location.

2.1.1. Exposure pathways

Possible exposure pathways are inhalation of organic vapors, PCE/TCE, or radioisotopes adhered to respirable dust particles, if any, listed in Table 2.2 released from soils; inhalation of dusts; accidental ingestion of chemical compounds or radioisotopes; and skin contact/absorption with soils containing organic vapors and radioisotopes.

The levels of chemical compounds and radioisotopes on the Site vary with location. Based upon anticipated Site activities, past Site activities, and prudent safety and hygiene practices during Site work, ingestion of Site chemical compounds or radioisotopes is highly unlikely. Exposure is also highly unlikely based on previous fieldwork conducted. However, as a precautionary measure, the breathing zone will be monitored and PPE will be worn to prevent adsorption of the various compounds or radioisotopes. The primary route of exposure is inhalation of organic vapors and dusts containing the chemical compounds or radioisotopes listed in Table 2.2. However, inhalation of airborne residuals approaching the OSHA Permissible Exposure Limits (PELs) at the breathing zone is unlikely because of natural ventilation of the work area, safe work practices, PPE, and air monitoring. Some compounds may cause noticeable odors during sampling. Confined spaces, such as inside tanks and in trenches (greater than 5 feet), represent special exposure considerations because of the reduced natural ventilation and restricted means of egress. Special procedures will be used to prevent injury and overexposure in confined spaces.

2.2. Tasks

Tasks to be conducted may include:

- Mobilization/demobilization (non-intrusive)
- Survey (non-intrusive)
- Utility markout (non-intrusive)
- Soil screening (intrusive)
- Manual soil sampling (intrusive)
- Site restoration (non-intrusive)

These tasks are presented in the attached Work Plan. Site activities will be conducted in accordance with the procedures described in the Work Plan. Both the potential health and safety hazards and the hazard control procedures for each task are discussed below. If additional work tasks are identified after this HASP has been implemented which are not adequately addressed by this HASP, a task specific addendum to this HASP will be prepared to appropriately address the health and safety issues associated with the new work task before the initiation of the task in question. Section 11 provides a format for the task specific addenda.

2.3. Mobilization/demobilization (non-intrusive)

2.3.1. Potential health hazards and compounds of concern

There is minimal potential for contact with Site-related compounds during mobilization/demobilization activities. Site workers may be exposed to physical hazards related to moving equipment.

2.3.2. Controls

Level D PPE will be used to minimize the potential for head, foot, eye, and hearing injuries related to equipment movement.

2.4. Utility markout (non-intrusive)

2.4.1. Potential health hazards compounds of concern

There is minimal potential for contact with Site-related compounds during utility markout. Site workers may be exposed to physical hazards related to moving equipment.

2.4.1. Controls

Level D PPE will be used to minimize the potential for head, foot, eye, and hearing injuries related to equipment movement.

2.5. Manual soil sampling (intrusive)

2.5.1. Potential health hazards and compounds of concern

Soil sampling will be performed in multiple areas of the Site. There is potential for encountering organic vapors and radioisotopes during sampling activities. Potential exposure pathways may include skin contact with soil contaminants and inhalation from the release of organic vapors from subsurface soil samples. There is a potential for musculoskeletal injuries when using soil collection equipment and bending to collect the samples, and the potential to get dirt in the eyes. Other hazards associated with soil sampling include slipping on wet, muddy surfaces created by spilled water or precipitation and electrical hazards associated with the use of electrical equipment around water or wet surfaces.

2.5.2. Controls

Level D PPE will be worn. Coveralls are to be worn when there is a need to handle or work with potentially contaminated soil or liquid. Workers must wear hearing protection when working near operating heavy machinery and will remain upwind of vehicle exhaust.

To minimize exposure to organic vapors and radioisotopes during soil sampling, air in the worker's breathing zones will be monitored using a photoionization detector (PID) and care will be taken to avoid dust generation. Workers will also wear lapel filters for the analysis of alpha radiation. Subsequent monitoring and respirator wear will be in accordance with Section 6.4 of this HASP.

To further minimize radiation exposure, a series of safety screening procedures will be used. The cores will be scanned as they are removed from the borehole. A second radiation scan is performed when the acetate is removed from the metal spoon. A final radiation scan is performed inside the trailer as the acetate is sliced open and the soil is logged. During the final scan the core is scanned for organic vapors using a PID and radionuclides using appropriate survey instruments.

During drilling a ground fault interrupter will be used in the absence of properly grounded circuitry or when electrical equipment is used in wet conditions. Extension cords will be protected or guarded from damage and be maintained in good condition.

Employing proper lifting techniques can prevent back strain. Heavy equipment, such as pumps and generators, will only be lifted or moved with proper techniques, mechanical devices, and/or using two or three personnel.

2.6. Site restoration (non-intrusive)

2.6.1. Potential health hazards and compounds of concern

If performed, there is minimal potential for contact with Site contaminants during Site restoration activities. Site workers may be exposed to hazards related to moving equipment.

2.6.2. Controls

Level D PPE will be used to minimize the potential for head, foot, eye, and hearing injuries related to equipment movement.

3. Personnel training

3.1. Site workers

Site workers performing the invasive activities associated with chemical hazards outlined in this HASP must have completed a training course of at least 40 hours meeting the requirements of 29 CFR 1910.120(e) for safety and health at hazardous waste operations. If the course was completed more than 12 months before the date of Site work, completion of an approved, 8-hour refresher course on health and safety at hazardous waste operations is required.

O'Brien & Gere employees must comply with the O'Brien & Gere Quality Assurance Manual with respect to programs including respiratory protection, hazard communication, auditing, and confined space entry.

3.2. Management and supervisors

In addition to the requirements described in Section 3.1 for Site workers, the Field Supervisor must have completed an 8-hour supervisor course meeting the requirements of 29 CFR 1910.120(e) on supervisor responsibilities for safety and health at hazardous waste operations.

3.3. Emergency response personnel

Site workers who respond to emergency situations involving health and safety hazards must be trained in how to respond to such emergencies in accordance with the provisions of 29 CFR 1910.120(l). Skills such as cardiopulmonary resuscitation (CPR), mouth-to-mouth rescue breathing, avoidance of blood borne pathogens, and basic first aid skills may be necessary.

3.4. Site-specific training

Site-specific training will be provided to each Site worker governed by this HASP. Site workers will be briefed daily by the Field Supervisor or by the SSHC as to the potential hazards that may be encountered during that day. Topics will include:

- Availability and location of the HASP;
- Recognition and control of general Site hazards and specific hazards (including heat and cold hazards) in the work areas;
- Selection, use, testing, and care of the body, eye, hand, foot and respiratory protective equipment being worn and the limitations of each;
- Decontamination procedures for Site workers, their PPE, and other equipment used on-Site;
- Emergency notification procedures (including hand signals) and evacuation routes to be followed;
- Emergency response procedures and requirements; and
- Procedures for obtaining emergency assistance and medical attention.

3.5. Training certification

A record of employee training completion will be available upon request. The certificates are maintained at the O'Brien & Gere Corporate offices in Syracuse, New York. This record will include the dates of the completion of worker training, supervisor training, refresher training, emergency response training, and Site-specific training for Site workers.

4. Personnel protection

4.1. Protective equipment introduction

The basic level of PPE to be used during activities at the Site is modified OSHA Level D. PPE may be upgraded based on air monitoring results or at the discretion of the Project Manager and based on the SSHC's recommendations. The SSHC and the Project Manager must approve a downgrade of PPE.

If the SSHC determines that field measurements or observations indicate that a potential exposure is greater than the protection afforded by the equipment or procedures specified in this or other sections of this HASP, the work will be stopped, and Site workers will be removed from the Site until the exposure has been reduced or the level of protection has been increased.

Site respirator users must be trained and medically approved to use respiratory protection. Respirators issued are approved for protection against dust and organic vapors by NIOSH. Respirators are issued for the exclusive use of one worker and will be cleaned and disinfected after each use by the worker. Respirator users must check the fit of the respirator before each day's use to see that it seals properly. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. No facial hair that interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory PPE. Cartridges and filters for air-purifying respirators in use will be changed daily at a minimum. The user will inspect the integrity of air-purifying respirators daily.

4.2. Protective equipment description

The level of PPE that may be used on-Site is categorized as Level C or D, based upon the degree of protection required. The following is a brief description of the two levels that may be used on-Site.

Level C. The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air-purifying respirators are met. The following constitute Level C equipment:

- NIOSH approved full-face or half-face, air purifying respirators with organic vapor cartridges, radionuclide and high efficiency dust (HEPA) filters
- Chemical-resistant clothing (overalls, chemical-splash suit, disposable chemical-resistant overalls)
- Coveralls (optional)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, outer, chemical-resistant, with steel toe and shank
- Optional chemical resistant boot covers
- Hard hat
- Safety glasses with side shields
- Face shield and safety glasses when not wearing a full face respirator
- Hearing protection when working in noise hazardous areas or near operating heavy equipment.

Level D. A work uniform providing no respiratory protection, used only for prevention of skin contamination. The following constitute Level D equipment:

- Coveralls or other skin protective clothing (long sleeve shirts and long pants)
- Gloves
- Boots or shoes, chemical-resistant, steel toe and shank
- Optional chemical resistant boot covers
- Safety glasses or chemical splash goggles
- Hard hat
- Escape mask (optional)
- Hearing protection when working in noise hazardous areas or near operating heavy equipment.

4.3. Protective equipment failure

If an individual experiences a failure or other alteration of PPE that may affect its protective ability, that person is to leave the work area immediately. The Project Manager or the SSHC must be notified and, after reviewing the situation, are to determine the effect of the failure on the continuation of on-going operations. If the Project Manager or the SSHC determine that the failure affects the safety of workers, the work Site, or the surrounding environment, workers are to be evacuated until corrective actions have been taken. The SSHC will not allow re-entry until the equipment has been repaired or replaced and the cause of the failure has been identified.

4.4. Dust suppression

The SSHC shall implement one or more of the following dust control measures if dusty conditions are observed:

- Wetting building surfaces, roads, or debris
- Moving materials in properly tapered or watertight container
- Modifying work practices
- Restricting vehicle speeds to 10 mph

5. Medical monitoring

5.1. Medical surveillance program

The contractor will have implemented a medical monitoring program in accordance with 29 CFR 1910.120. The contractor's program will be designed to monitor and reduce health risks to employees potentially exposed to hazardous materials and to provide baseline medical data for each employee involved in work activities. It is also designed to determine the employee's ability to wear PPE such as chemical resistant clothing and respirators.

Medical examinations are administered on a post-employment and annual basis and as warranted by symptoms of exposure or specialized activities. The examining physician is required to make a report to GTEOSI of any medical condition that would increase the employee's risk when wearing a respirator or other PPE. The contractor will maintain Site personnel medical records as required by 29 CFR 1910.120 and by 29 CFR 1910.134, as applicable.

Employees performing the activities listed in the Work Plan of this document have or will receive medical tests as regulated by 29 CFR 1910.120. Where medical requirements of 29 CFR 1910.120 overlap those of 29 CFR 1910.134, the more stringent of the two will be enforced.

5.2. Respirator certification

Employees who may wear respiratory protection have been provided respirators as required by 29 CFR 1910.134. This standard requires that an individual's ability to wear respiratory protection be medically certified before performing designated duties.

5.3. Heat/cold stress

The timing and location of this project may be such that heat/cold stress could pose a threat to the health and safety of Site personnel. Work/rest regimens will be employed as deemed necessary by the SSHC so that Site workers do not suffer adverse effects from heat/cold stress. Special clothing and an appropriate diet and fluid intake will be recommended to all on-Site personnel to further reduce these temperature-related hazards. Site workers should stop work and notify the SSHC when they observe symptoms of heat/cold stress in themselves or co-workers.

5.3.1. Monitoring

Heat stress monitoring of personnel wearing protective clothing should be considered when the ambient temperature is 70°F or above. To monitor the worker, one of the following methods should be employed:

- Heart rate should be measured by the radial pulse for a 30 second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following cycle by one-third; or

- Oral temperature should be measured at the end of the work period (before drinking). If oral temperature exceeds 99.6°F, shorten the next work cycle by one-third without changing the rest period. If the oral temperature still exceeds 99.6°F at the beginning of the next rest period, shorten the next work cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when his/ her oral temperature exceeds 100.6°F.

5.3.2. Cold stress work/rest schedule

Work/rest schedules must be altered to minimize the potential for cold stress. Cold stress is defined as a decrease in core body temperature to 96.8°F and/or cold injury to body extremities. Decreases in core body temperature are associated with reduced mental alertness, reduction in rational decision making, or loss of consciousness in severe cases. Symptoms of cold stress include pain in extremities (i.e. hands and feet) and severe shivering. If workers experience these symptoms, then stop work and implement the following controls:

- Workers must change into adequate dry insulating clothing; and

- Adjust the work/rest schedule to increase the amount of rest/ rewarming time.

Safety meetings discussing symptoms of cold stress, clothing requirements, and work breaks must be held when the wind chill temperature drops below 0^0F and EACH DAY the wind chill temperature is below 25^0F.

Note: Wind chill temperatures are a combination of actual air temperature and wind speed. Wind chill temperatures 25^0 below zero are extremely dangerous. Workers must protect any exposed skin, especially the face, ears, and fingers.

6. Air monitoring

Organic vapors and radioactivity above background may be present in the investigation areas where invasive activities take place. Real time monitoring of organic vapors and radioactivity will be conducted on-Site by, or under the supervision of the SSHC. The SSHC will evaluate whether the personal protective measures employed during field activities are appropriate. Field personnel will record readings in a notebook at the Site. The SSHC will be responsible for maintaining monitoring instruments throughout the investigation.

6.1. Field instrumentation and calibration

On-Site air monitoring will include the use of a PID, a portable aerosol monitor (DustTrak), and radiation detection instrumentation. The instruction manuals for this equipment, including maintenance and calibration details, will be kept on Site for the duration of the project and while monitoring equipment is in use.

6.1.1. Photoionization detector (PID)

Hazard monitored. Organic and inorganic gases and vapors.

Application. Detects the presence and total concentration of many organic and some inorganic gases and vapors.

Detection method. Ionizes molecules using UV radiation, produces a current that is proportional to the number of ions present.

General care and maintenance. Recharge daily or replace the battery. Regularly clean the lamp window. Regularly clean and maintain the instrument and its accessories. Turn the function switch to "stand-by" and allow the instrument to "warm up" for 5 minutes. Calibrate once a day using an isobutylene gas standard according to the manufacturer's instructions. Repeat the procedure to validate calibration.

Typical operating time. 10 hour, 5 hour with strip chart recorder.

6.1.2. Work area monitoring

Work area monitoring

Hazard monitored. Alpha radiation.

Application. Detects the presence and activity levels of alpha radiation associated with uranium and thorium.

Detection method. Perimeter work area air sampling at up to four locations will be established. Alpha particles that have been collected on the filter react with a detector that is proportional to the activity present.

General care and maintenance. Keep clean. Calibrate sampling equipment daily prior to field activities.

Thermoluminescent dosimeter (TLD)

Hazard monitored. Accumulated radiation dose.

Application. One whole body badge and one ring badge will be worn by each worker engaged in Site activities to evaluate radiation exposure to the body and to extremities.

Detection method. TLDs contain crystals of lithium fluoride or an equivalent which when exposed to radiation, become excited and have the ability to maintain an excited state over a long period of time. The energy accumulated from exposure to radiation is maintained in the badge media until it is analyzed.

General care and maintenance. Whole body and ring badges must be replaced after a maximum sample period of one month and submitted for analysis. All body and ring badges must be kept on-Site with the control badge for each type of dosimeter for quality control and quality assurance.

Self-reading pocket dosimeters

Hazard monitored. Gamma radiation.

Application. One self-reading pocket dosimeter will be worn by each worker engaged in Site activities. Gamma particles create an electric charge within the dosimeter that is proportional to the activity present.

Detection method. The self-reading pocket dosimeter uses an extremely sensitive fiber voltmeter and an ion chamber to measure the total amount of radiation to which the dosimeter was exposed. The measured radiation exposure is a digital display that is read by looking at a source of light through the eyepiece end of the dosimeter.

General care and maintenance. Recharge each dosimeter to 165 volts and zero the dosimeters on a daily basis prior to the start of work.

6.1.3. Portable aerosol monitor (DustTrak)

Hazard monitored. Particulate emissions.

Application. Detects the presence of total or respirable particulates necessary to meet the requirements of TAGM 4031 and OSHA 29 CFR 1910.1000.

Detection method. The DustTrak uses a laser photometer to provide a real-time measurement based on 90^0 light scattering. A pump draws both solid and liquid particles through an optics chamber where they are measured. A cyclone size separator may be attached to measure particles less than 10 microns. Data logging capabilities may also be used for monitoring over an extended period of time.

General care and maintenance. Replace batteries as needed. Keep clean and follow manufacturer's instructions for calibration procedure.

6.2. Air sampling

The air in the work area will be monitored with a portable PID and radiation survey instrumentation to determine the presence and concentration of organic vapors and radiation during Site restoration and manual soil sampling activities. Individual monitoring, if necessary, will be performed in the breathing zone and, if workers are wearing respiratory protective equipment, outside nears the face piece. The sampling strategies described below may be modified if work tasks or operations change. Monitoring instruments will be checked for appropriate response, in accordance with the manufacturer's instructions, before use each sampling day.

6.2.1. PID monitoring

The air will be monitored with a portable PID equipped with a 10.2 electron volt detector to determine the presence and concentration of organic vapors. Samples will be collected continuously and recorded at approximately 15-minute intervals. The PID will be checked for positive and accurate response to a predetermined concentration of isobutylene in accordance with the manufacturer's instructions before use each sampling day.

Before the start of work, the PID will be used to determine the concentration of organic vapors upwind of the work Site. When organic vapor levels exceed the action level, the PID will be used to measure the organic vapor level downwind of the work area.

6.2.2. Radiation monitoring

Area air samples for alpha radiation will be collected at the perimeter of the work zone at up to four locations. The number of sample locations will be determined by the SSHC. Air sample collection will consist of a mixed cellulose ester (MCE) filter in a plastic cassette attached to a calibrated vacuum pump with flexible tubing. The MCE filter will be analyzed using a Ludlum Model 2929 scalar (or equivalent instrument).

The filter apparatus will be mounted at approximately 3 to 5 feet off the ground and shall be operated for the duration of soil sampling activities at the determination of the SSHC. Filters will be analyzed the following workday or at a frequency established by the SSHC in consultation with the RSO.

To evaluate accumulated dose, each individual engaged in Site activities will be required to wear one TLD. TLDs will be sent to a qualified laboratory for analysis (Landauer®, Inc.) at the end of Site activities or at the end of each month of work. To evaluate daily measurable exposures, these individuals will also be required to wear a pocket self-reading dosimeter.

6.3. Quality control – field sampling

The SSHC, or someone under the direct supervision of the SSHC, will record the results of the air sampling for health and safety purposes in bound logbooks or on appropriate data sheets. These books and sheets will be used to document the collection of samples and data so that an individual data set can be traced to its point of origin, the sampler, and the sampling equipment used. Sampling will be performed according to the manufacturer's instructions.

6.4. Action levels

Action levels are used to determine when activities should stop, when Site evacuation is necessary, to select emergency response levels, and to change PPE levels. Action levels were developed based on actual sample analysis and regulatory exposure limits published by OSHA.

6.4.1. Organic vapors

Organic vapors may be liberated from the ground water or from the soil during Site activities. A PID will be used to determine the presence of organic vapors. Work will cease at any time that the reading on the PID exceeds 5 parts per million (ppm) of organic vapors. If the level is measured at a wellhead, or other sampling location, additional sampling in the worker's breathing zones will be initiated at that time. If the level in the worker's breathing zone is less than 5 ppm, work may resume with continuous alternate breathing zone and wellhead monitoring. Breathing zone monitoring may cease when the wellhead level is less than 1.0 ppm.

Level C protection (air purifying respirators and chemical resistant clothing) will be donned by the Site workers when the organic vapor concentration in the respective breathing zone exceeds 5 ppm as indicated on the PID. Once the respirators are on, work may resume with continuous monitoring alternating between the breathing zone and the wellhead. Respirators may be removed when the breathing zone level is less than 1.0 ppm. Breathing zone monitoring may cease when the work area level is less than 1.0 ppm.

If the measured organic vapor concentration is greater than or equal to 135 ppm, the workers will leave that work area. Actions, such as increasing ventilation, will be implemented to promote dispersion of the vapors. Workers wearing respirators may return when the level is less than 100 ppm. The action levels for air purifying respirators then apply.

The organic vapor level will be measured upwind and 50 feet downwind of the Site, at approximately 60-minute intervals, whenever air-purifying respirators are being worn. If the downwind concentration exceeds the upwind concentration by more than 5 ppm, work on the Site will stop until the downwind concentration is less than 5 ppm greater than the upwind concentration.

6.4.2. Radiation levels

Radiation levels for uranium or thorium at or in excess of their respective derived air concentration will require the use of respirators and institution of a urinalysis program at the recommendation of the RSO.

Respirator use can be discontinued pending review of newly acquired data by the RSO and when radiation levels return to a level below the derived air concentrations.

6.4.3. Particulates

Upon visual observation of air-borne particulate matter or at levels exceeding the primary standards that are associated with on-Site activities, a water spray will be applied as a control measure. The primary standards and guidance for particulate matter less than 10 microns in diameter are referenced in TAGM 4031. The primary standards are 150 $\mu g/m^3$ over a 24-hour averaging time and 50 $\mu g/m^3$ over an annual averaging time.

7. Community air monitoring plan (ground intrusive activities)

Real-time air monitoring for organic vapors and particulate levels at the perimeter of the work area will be conducted as follows:

- Organic vapors will be monitored at the downwind perimeter of the work area. If total organic vapor levels exceed 5 ppm above background, work activities will be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. Readings must be recorded and be available for NYSDEC and NYSDOH personnel to review.

- Particulates will be continuously monitored upwind (work zone perimeter) and downwind with temporary particulate monitoring stations. If the downwind particulate level is 150 g/m^3 greater than the upwind particulate level, then dust suppression techniques must be employed. Readings must be recorded and be available for NYSDEC and NYSDOH personnel to review.

7.1. Vapor emission response plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- The organic vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. When work shutdown occurs, downwind air monitoring as directed by the SSHC will be implemented to establish that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified.

7.2. Major vapor emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, work activities must be halted.

If following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality will be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 foot zone).

If efforts to abate the emission source are unsuccessful and if the following levels persist for more than 30 minutes in the 20 foot zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect;

- If organic vapor levels are approaching 5 ppm above background.

However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area.

7.3. Major vapor emission response plan

Upon activation, the following activities will be undertaken:

1. Emergency Response Contacts as listed in the HASP of this Work Plan will go into effect.

2. The local police authorities will immediately be contacted by the SSHC and advised of the situation.

3. Frequent air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the SSHC.

7.4. Air monitoring plan for radionuclides

Continuous air monitoring for uranium and thorium will be conducted at the perimeter of the work area whenever intrusive work is in progress. This monitoring will assess if off-Site airborne radioactivity releases are less than ten percent of the environmental limits of NYSDEC Part 380. It will also identify that workers are not exposed to more than ten percent of the occupational limits for radionuclides as listed in the New York Department of Labor Code Rule 38.

Continuous air monitoring using an MCE filter attached to a vacuum pump will be established prior to any work activities. The sampler will be located at the edge of the work area. The number and location of samples shall be at the discretion of the SSHC. Filters will be analyzed the following workday or at a frequency established by the SSHC in consultation with the RSO. A new filter paper shall be installed at the beginning of each workday.

A gas flow proportional counter or other lab type instrument (Ludlum Model 2929) will be used to assay the filters from lapel samplers and perimeter sampler for alpha radiation. It is preferable to wait 12 to 24 hours before counting an air sample to allow adequate time for the radon daughters to decay and minimize interference from this source. The count rate of the filter samples will be verified to see that the result is actually an increase in airborne radioactivity.

The instrument will be source checked each day to verify operation of the detectors and a background radiation count will be performed. The lab instrument will be calibrated with an NIST traceable uranium or thorium source in a disc geometry. The activity is electroplated onto the surface of the disc to simulate the geometry of the air sample. The calibration will determine the efficiency to be used when calculating the activity of the air sample. The activity measured will be divided by the volume of the air sample to give the radioactivity in microcuries per milliliter. The limits for thorium are the most restrictive and as such will be used until a nuclide specific assay is available.

When a nuclide specific analysis is required, air samples will be sent to an off-Site laboratory. This will be done when an air sample exceeds ten percent of any applicable thorium based limit.

Blank air samples will be taken periodically upwind of intrusive work activity. These blanks can be counted to give an accurate estimate as to the background levels of radon daughters collected on particulate air samples.

8. Site control

8.1. Site security

Site security will be monitored and controlled by the Project Manager, the Field Supervisor, and the SSHC. Their duties will include limiting access to the work area to authorized personnel, overseeing project equipment and materials, and overseeing work activities. The procedures specified below will be followed to control access to each work Site to prevent persons who may be unaware of Site conditions from exposure to hazards. Work area control procedures may be modified as required by Site conditions.

8.2. Site security

Two categories of work zones will be established: an exclusion zone immediately around the work area and a buffer zone. The remainder of the Site will be the support zone. Control procedures to limit exposure to work hazards, short of formal zones, will be established as appropriate and at other times when Level D protective clothing is appropriate.

8.2.1. Exclusion zone

The exclusion zone is where soil containment and sampling are conducted. The SSHC will identify this zone. It must be centered on the work activities. This zone will be designated with flags attached to portable stakes or cones installed before beginning the fieldwork. Based on the discretion of the SSHC, and in coordination with GTEOSI and current property owners, a larger portion of the Site may be designated as the exclusion zone.

The zone may be enlarged to contain the necessary ancillary equipment and personnel for the work to be done.

8.2.2. Buffer zone

The buffer zone contains personnel and equipment decontamination stations. The buffer zone will generally be located upwind of the work activities. This zone will only be large enough to contain equipment and personnel necessary to keep potentially contaminated media and materials in the immediate work area. This area will be designated with yellow flags attached to portable stakes or cones or other means.

8.2.3. Support zone

The remainder of the Site is defined as the support zone. The support zone contains support facilities, extra equipment, transport vehicles, and additional personnel and equipment necessary to manage and perform work activities.

8.2.4. Zone map

Site workers leaving an exclusion zone will be decontaminated in a buffer zone to prevent possible contamination from entering the support zone. The Field Supervisor and the SSHC will establish decontamination locations for each Site. Because of the number of locations at which sampling will be conducted and the repetitive nature of the work, a map depicting the exclusion and decontamination zones will not be posted. The layout of the zones, the procedures to be followed for decontamination and zone control, and the signs used to indicate the zones will be reviewed during the daily briefings before beginning each day's work.

8.2. Site access procedures

8.3.1. Zone map

The Field Supervisor and the SSHC will establish access procedures for each Site area. Access will be monitored by the SSHC, who will maintain a log-in sheet for Site workers and guests. The log-in sheet will include, at a minimum, personnel on the Site, their arrival and departure times and their destination on the Site.

8.4. Site communications

Cellular telephones will be assigned to the Field Supervisor and SSHC. These will be used during on-Site activities to facilitate communications for emergency response and other purposes and to serve as the primary off-Site communication network. If available, a cellular telephone will provide back up for the facility phones.

8.5. Housekeeping

The Site shall be maintained in a clean and orderly condition at all times. Construction areas shall be free of waste materials, debris, and rubbish to the extent feasible. Materials and equipment shall not obstruct traffic or emergency response activities. Waste materials, debris, and rubbish shall periodically be removed from the Site and properly disposed off-Site as required by Site conditions and activities.

8.6. Confined space entry

The Contractor's Confined Space Entry procedure must be followed and a *Hot Work & Confined-Space Entry Permit* must be completed prior to entry. When such entry is necessary procedures identified in Volume 3 of the O'Brien & Gere Engineers Quality Assurance Manual must be followed. FULLY completed confined space entry permits must be sent to the Contractor ASH when the permits expire or are canceled.

Persons entering manholes, tanks or similar confined spaces must have a body harness and lifeline attached. When vertical entry/exit is required greater than 5 feet, a tripod and man-winch must be setup prior to entry. The standby person must be familiar with its operation. Off-Site rescue services (i.e. fire department) must also be available and notified of the entry. Standby persons shall not enter confined spaces to conduct rescue or first aid activities. If the potential for a hazardous atmosphere has been eliminated, then rescue or first aid personnel do not require an SCBA for entry.

8.7. Fall protection

OSHA-approved methods of fall protection are required under the following conditions:

- An employee is working 6 feet or more above the ground;
- An employee is working in a manlift higher than 6 feet above the ground;
- An employee is involved in assembly/disassembly of scaffolds, work platforms or temporary surfaces;
- An employee is working over dangerous equipment/conditions; and
- An employee is working within 6 feet of an unprotected edge of a floor/ wall opening or roof.

The SSHC must discuss deviations from this requirement and other Contractor's *Fall Protection* program requirements with the Contractor's ASH.

8.8. Safety and toolbox meetings

8.8.1. Safety meetings

At a minimum, informal safety meetings must be held daily for Site workers and subcontractors. Task-specific safety meetings for non-routine or high hazard tasks should also be conducted with Site workers assigned to those tasks. The following will be covered:

- The day's work activities and/or task-specific work activities are to be reviewed and any safety considerations identified are to be discussed; and

- The previous day's work activities are to be reviewed and any health or safety considerations or deficiencies are to be discussed.

8.8.2. Toolbox meetings

Toolbox meeting will be conducted at a minimum, once per week. Weekly topics will cover a multitude of Health and Safety related information and will be documented in the following manner:

- Attendees are to sign in on a *Safety/Toolbox Meeting* form; and

- A copy of the *Safety/Toolbox Meeting* form will be filed on-Site and in the permanent project files for the duration of the project.

Safety/Toolbox Meetings may be conducted by subcontractors if equivalent documentation guidelines are met, however a copy of each meetings document must be kept on-Site for the duration of the project by the Contractor's SSHC.

8.9. Drum handling guidelines

Drums are not anticipated to be encountered at this Site during drilling. In the unlikely event that they are encountered, the SSHC must stop work, notify a GTEOSI Representative and the Project Manager. At a minimum, the following drum handling guidelines must be followed after making the above notifications and modifying this HASP (if required).

- Extreme care will be exercised in opening drums or other sealed containers in which the contents may be harmful to personnel. When practical, a drum will not be moved or opened unless the drum appears to be structurally sound.

- Drums will be opened in such a manner that excess interior pressure, as evidenced by bulging or swelling, has been safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding will be placed between personnel and the drums to reduce the risks of injury.

- Drums that may rupture, leak or spill when moved will be emptied into a Department of Transportation approved 85-gallon salvage drum using a portable hand pump (for liquid wastes) or a hand shovel (for solids and sludges).

- Drums shall be moved by grappler, non-metallic slings, within a backhoe bucket or front-end loader, or by other means that will minimize damage to containers and release of contents.

- Additional overpack units, in addition to those required to overpack the drums, should be provided on Site adjacent to the staging area.

Additionally, drums may be generated on the Site to collect wastewater or soil cuttings from the borings. In the event that drums are generated, they will be appropriately sampled and stored until off-Site disposal can be scheduled.

8.10. General worker safety rules

Workers will be expected to follow the established safety practices for their respective tasks. The need to exercise caution in the performance of work is made more acute due to weather conditions and restrictions in mobility, peripheral vision, and communication caused by the PPE. To enhance Site safety, the following general worker safety procedures have been established:

- Eating, drinking, chewing gum, chewing tobacco, smoking, or any practice that increases that probability of hand-to-mouth transfer and ingestion of material is prohibited in work areas. Specific areas will be designated for these practices.

- In any unknown situation, always assume the worst conditions and plan accordingly.

- Employ the "buddy" system when appropriate Be alert.

- Minimize contact with chemicals or materials containing residuals. Avoid breathing chemical odors. Stay upwind of the containment source if possible. Do not expose skin to water, chemicals, or soil. If one becomes dirty or wet with contaminated fluids, clean up immediately using plenty of water. Establish both work areas and decontamination zones, and develop safety procedures to minimize exposure to chemicals.

- Hands and face must be thoroughly washed when leaving the support zone and before eating, drinking, or using restrooms.

- Avoid heat, cold, and other work stresses related to wearing the protective gear. Work breaks should be planned to prevent stress-related accidents or fatigue.

- Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.

- Withdraw from a hazardous situation to reassess procedures and consult with the SSHC.

- Showers will be required when deemed necessary by the SSHC.

- Project personnel should check for any personal habit that may allow contaminated soil or water onto or into the body. No jewelry except medical alert ID's may be worn. This requirement may be modified at the discretion of the SSHC.

- Be aware that medicine and alcohol can mask or increase the effects of exposure to chemical contaminants or enhance symptoms of illness. Consumption of alcohol and working when ill are prohibited. Prescribed drugs must only be used at the direction of a physician familiar with the person's work activities.

- Maintain PPE. Check it daily to ensure that it is clean and in good working order.

- Follow the procedures set forth in this HASP. Notify the SSHC if there is a need to change the health and safety procedures.

8.11. Health and safety log

The SSHC shall maintain a DAILY health and safety log to document daily safety inspections and other safety-related information. The daily log must include the following information when applicable:

- Date and areas inspected (be specific);
- Equipment used and work tasks being performed;

- PPE and devices used;
- Violations of this HASP;
- Instances of job related injuries/illnesses (document per this HASP);
- Corrective measures put in place to resolve safety deficiencies;
- Monitoring performed;
- SSHC signature and date and military time of log entry.
- Daily weather conditions;
- Summary of air monitoring performed that week (including results of perimeter monitoring sample analysis completed that week).

Reports, logs, Safety/Toolbox Meeting forms, air monitoring records, and similar safety-related information shall be kept on-Site for the duration project.

Note: The SSHC's Health and Safety Log should be handwritten in a bound notebook. It does not have to be a separate notebook and may be included within the supervisor's daily work/activity log or equivalent. The notebook should be available for review by GTEOSI and other authorized personnel.

8.12. Site communications

Two sets of communication systems will be established prior to initiating Site activities:

- internal communications among personnel on-Site; and
- external communication between on-Site and off-Site personnel.

Internal communication protocol is designed to alert team members to emergencies; pass along safety information; time remaining until next rest period; changes in the work to be accomplished; and maintenance of Site control. An external communication system between on-Site and off-Site personnel is necessary to coordinate emergency response, report to management, and maintain contact with essential off-Site personnel.

On-Site internal communications will be conducted through verbal communications and/or hand-held two-way FM radios. Nonverbal communications will be used when background noise impedes verbal communications. Nonverbal communications will use standard hand and air-horn signals.

8.12.1. Communication procedures

- A channel will be designated as the radio frequency for personnel communications via hand-held two-way FM radios.

- Personnel in the Exclusion Zone should remain in constant radio and /or verbal communication or within sight of the Field Supervisor or designated personnel. Any failure of radio communication requires an evaluation of whether personnel should leave the Exclusion Zone.

- Three short blasts on the air horn is the emergency signal to indicate all personnel should leave the Exclusion Zone and proceed to an on-Site place of safe refuge (i.e. the Support Zone).

- A ten second blast with an air horn will indicate the initiation of a Site evacuation. All Site personnel shall evacuate the Site and proceed to an off-Site place of safe refuge.

- External communications (when feasible) during Site activities will be accomplished by use of telephone established in the Support Zone.

8.12.2. Nonverbal communication

The following standard hand signals will be used in case of failure of radio communications:

Signal	*Meaning*
Hand gripping throat	Out of air, can't breathe
Grip partner's wrist or both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I am all right, I understand
Thumbs down	No, negative

8.12.3. Lines of communication

In general, all health and safety concerns will be first addressed by the SSHC. The SSHC will then pass on all pertinent information to the Field Supervisor, Project Manager, and RSO respectively. The GTEOSI Representative will be notified as necessary.

8.13. Sanitary facilities

Provisions will be made for sanitary facilities for use by Site personnel. These provisions will consist of those facilities in existing buildings on Site. In the case that no sanitary facilities can be made available in previously existing buildings, portable facilities will be provided.

9. Decontamination

9.1. Personnel decontamination procedures

Work activities may occur in widely separated locations. For this reason, if decontamination is required it will be performed at each work location, using temporary facilities. The SSHC will be responsible for supervising the proper use and decontamination of PPE used in Level C work. The SSHC will also establish and monitor the decontamination line.

Decontamination involves scrubbing with a soap and water solution followed by rinses with potable water. Decontamination will take place on a decontamination pad. Dirt, oil, grease, or other foreign materials that are visible will be removed from surfaces. Scrubbing with a brush may be required to remove materials that adhere to the surfaces. Splash protection garments will be washed with soap and potable water before removal. Garments will be air dried before storage or disposal. Wastewater from personnel decontamination will be disposed of with the wastewater's from equipment decontamination. Respirators will be sanitized as well as decontaminated each day before re-use. The manufacturer's instructions will be followed to sanitize the respirator masks.

The following decontamination protocol, or one providing the same level of decontamination, will be followed if necessary:

Station 1 - equipment drop Provide a table covered with a plastic drop cloth. Deposit equipment used on-Site including tools, sampling devices and containers, monitoring instruments, radios and clipboards on the table.

Station 2 - outer garment, boots, and gloves wash and rinse Establish a wash station for gloves, boots, and the protective suit (when worn). Scrub outer boots, outer gloves, and protective suit with detergent and water. Rinse with potable water.

Station 3a - outer boot and glove removal Provide seating for use during the removal and collection of outer boots. Remove outer boots. Deposit them in a container with a plastic liner. If the boots are to be reused after cleaning, place them in a secure location near the work Site. Provide a location for removal, collection, and disposal of outer gloves. Remove the outer gloves. Deposit them in a container for disposal. During hot weather a cool down station with chairs, fans, and replenishing beverages may be set up in this area.

Station 3b - filter or cartridge exchange This station will be established only if respirators are worn. The worker's respirator cartridges and filters can be exchanged, new outer gloves and outer boots donned, and joints taped at this station. From here the worker can return to work duties in the exclusion zone.

Station 4 - outer garment removal This station will only be provided if a protective outer garment is worn. Provide a bench to sit on during the removal of the protective garment. If the garment is disposable, deposit it in a container with a plastic liner; otherwise, hang it up to air dry.

Station 5 - respirator removal This station will be established only if respirators are worn. Remove the respirator. Avoid touching the face with gloved fingers. Deposit the respirator on a plastic sheet.

Station 6 - inner glove removal Remove and dispose of inner gloves. Deposit them in a container with a plastic liner. If the gloves are to reused, place them in a secure location near the work Site, preferably in a plastic container.

Station 7 - field wash Provide a place for a field wash. Wash hands and face thoroughly. Shower if body contamination is suspected.

9.2. Monitoring equipment decontamination procedures

Sampling equipment used for health monitoring purposes will be cleaned of visible contamination and debris before initial use on Site, between uses, and after final use. Monitoring equipment that contacts contaminated media will be decontaminated after each use by a low phosphate detergent brushing followed by a clean water rinse. After decontamination, monitoring equipment will be stored separately from PPE. Decontaminated or clean equipment not in use will be covered with plastic and stored in a designated storage area in the support zone.

9.3. Decontamination supplies

The following supplies will be available on Site for the decontamination of personnel and equipment:

- Plastic drop cloths;
- Appropriate containers to collect non-reusable protective clothing;
- Plastic wash tubs;
- Soft bristled long-handle brushes;

- Appropriate containers to collect wash and rinse water;
- Hand spray units for decontamination;
- Soap, water, alcohol wipes, and towels to wash hands, faces, and respirators; and
- Washable tables and benches or chairs.

Water use will be minimized to the extent practicable by using disposable PPE. For disposal purposes, representative wipe samples from disposable PPE will be collected and analyzed using a Ludlum Model 2929 scalar or equivalent.

9.4. Collection and disposition of contaminated materials

Investigation derived waste (cuttings) and field decontamination wastes are to be collected, drummed, and disposed of in accordance with the procedures in the Field Sampling Plan.

9.5. Site refuse

Site refuse will be contained in appropriate areas or facilities. Trash and scrap metals from the project will be properly disposed.

ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
		SEW	11/28/00	

Directions to Nassau County Medical Center

From Lab building turn left onto Cantiague Rock Road
At traffic light (Prospect Ave / West John Street) Turn ~~Right~~ Left
Turn Right onto Charlotte Ave
Go under Railroad
Turn Right at HESS station onto Old Country Road
Turn Right onto Wantagh State Parkway - South
Exit 3W - NY 24 West - Hempstead
Turn Right on Hempstead Turnpike
Hospital Emergency Exit is on Right Side of Street

10. Emergency response

10.1. Notification of Site emergencies

In an emergency, Site personnel will signal distress either verbally or with three blasts from a horn (vehicle horn, air horn) maintained by the SSHC. The SSHC, Field Supervisor, or the Project Manager will immediately be notified of the nature and extent of the emergency.

Table 10-1 contains emergency telephone numbers. This table and directions to the hospital will be kept with the telephone and updated as needed by the SSHC. A portable on-Site telephone will be used to notify off-Site personnel of emergencies. The operating condition of this telephone will be determined daily before initiation of activities.

Table 10-2 *Emergency telephone numbers.*

Location	Telephone
Fire Department	(516) 931-0026
Police Department	(516) 573-6200
Ambulance	(516) 542-0123
GTEOSI Point of Contact (Al Ludwig)	(972) 507-5320
Chemical Emergency Advice	1-800-424-9300
Nassau County Medical Center	(516) 542-0233
National Spill Response Center	1-800-424-8802
NYSDEC Spill Hot Line	1-800-457-7362

Figure 10-1 contains a map showing the location and the route to the Nassau County Medical Center. Directions to the Nassau County Medical Center from the Site are:

- Take Cantiague Rock Road ½ block to Prospect Avenue; turn right and travel 4 blocks to Bond Street; turn left and proceed 5 block to Old Country Road; turn left and proceed 1 block to Carman Avenue; turn right and proceed 10 blocks to the hospital entrance on the left side of the street.

10.2. Responsibilities

The SSHC is responsible for responding to or coordinating the response of off-Site personnel to emergencies. In the event of an emergency, the SSHC will direct notification and response, and will assist the Field Supervisor in arranging follow-up actions. Upon notification of an exposure incident, the SSHC will call the hospital, fire, and police emergency response personnel for recommended medical diagnosis, treatment if necessary, and transportation to the hospital.

Before the start of Site activities, the SSHC will:

- Confirm that the following safety equipment is available: eyewash, first aid supplies, air horn, and fire extinguishers.
- Have a working knowledge of the contractor's safety equipment.
- Confirm that a map detailing the most direct route to Nassau County Medical Center (Figure 10-1) is prominently posted with the emergency telephone numbers (Table 10-1).
- Confirm that employees who will respond to emergencies have been appropriately trained.

Before work may resume following an emergency, used emergency equipment must be recharged, refilled, or replaced.

The SSHC, the Field Supervisor, and possibly the Project Manager are responsible for investigating the incident as soon as possible. The Project Manager will review the incident investigation report to determine whether and to what extent exposure actually occurred, the cause of exposure, and the means to prevent similar incidents. The resulting report must be signed and dated by the Project Manager, SSHC, and the Field Supervisor.

10.3. Accidents and injuries

In the event of an accident or injury, workers will immediately implement emergency isolation measures to assist those who have been injured or exposed and to protect others from hazards. Upon notification of an exposure incident, the SSHC will contact emergency response personnel who can provide medical diagnosis and treatment. If necessary, immediate medical care will be provided by personnel trained in first aid procedures. Other on-Site medical or first aid response to an injury or illness will be provided only by personnel competent in such matters.

10.4. Safe refuge

Before commencing Site activities, an area will be identified by the SSHC as the place of refuge for Site workers. In case of an emergency, personnel in the exclusion zone should evacuate the work area both for their own safety and to prevent hampering of rescue efforts. Following an evacuation, the SSHC will account for Site personnel, based on information in the Site Log. If evacuation from this area is necessary, project and personal vehicles will be used to transport Site workers to a place of refuge designated by the GTEOSI Representative.

10.5. Safe refuge

A fire extinguisher meeting the requirements of 29 CFR Part 1910 Subpart L, as a minimum, will be available in the support zone during on-Site activities. This is intended for use by a trained operator to control small fires. When a fire cannot be controlled with the extinguisher or a trained operator is not available, the exclusion zone will be evacuated, and the fire department will be contacted immediately. The SSHC or the Field Supervisor will determine when to contact the fire department.

10.6. Emergency equipment

The following equipment, selected based on potential Site hazards, will be maintained in the support zone for safety and emergency response purposes:

- Fire extinguisher;
- First aid kit; and
- Eye wash bottles

10.7. Emergency Site communications

Hand and verbal signals will be used at the Site. Portable on-Site telephones will be available during Site activities for emergency response communications.

10.8. Security and control

The SSHC or the Field Supervisor will monitor work zone security and control during emergencies, accidents, and incidents. The duties of the SSHC or the Field Supervisor include limiting access to the work zones to authorized personnel and overseeing emergency response activities.

11. Special precautions and procedures

The activities performed at the Site may expose personnel to both chemical, radiological, and physical hazards. The hazards associated with specific Site activities are discussed in Section 2. The potential for exposure to hazardous situations will be significantly reduced through the use of air monitoring, PPE, hazard awareness, training, and administrative and engineering controls. Other general hazards that may be present.

11.1. Heavy machinery/equipment

Site workers performing Site activities may use or work near operating heavy equipment and machinery. Respiratory protection and protective eyewear may be worn during portions of work activities. Since this PPE reduces peripheral vision of the wearer, Site workers should exercise extreme caution near equipment to avoid physical injury to themselves or others.

11.2. Additional safety practices

The following are important safety precautions that will be enforced during the completion of the activities listed in Section 2:

- Contact with potentially contaminated surfaces should be avoided whenever possible. Workers should minimize walking through puddles, mud, or other discolored surfaces; kneeling on ground; and leaning, sitting, or placing equipment on drums, containers, vehicles, or the ground.

- Site workers and equipment in the work areas will be minimized consistent with effective Site operations.

- Unsafe or inoperable equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.

- Activities in the exclusion zone will be conducted using the "Buddy System." The Buddy is another worker fully dressed in the appropriate PPE who can perform the following activities:

  - Provide partner with assistance
  - Observe partner for sign of chemical or heat exposure
  - Periodically check the integrity of partner's PPE
  - Notify others if emergency help is needed.

- The HASP will be reviewed frequently for its applicability to the current and upcoming operations and activities.

- Site workers will not handle, move or otherwise disturb drums of unidentified content or condition until an addendum to this HASP has been prepared to address associated health and safety concerns.

11.3. Daily log content

The Project Manager and the SSHC will establish a system appropriate to the Site investigation areas that will record, at a minimum, the following information:

- Site workers and other personnel conducting the Site activities, their arrival and departure times, and their destination at the investigation areas;

- Incidents and unusual activities that occur on the Site such as, but not limited to, accidents, breaches of security, injuries, equipment failures and weather related problems;

- Changes to the Work Plan and the HASP; and

- Daily information such as:
  - work accomplished;
  - the current Site status; and
  - air monitoring results

12. Format for HASP addenda

Addenda will be added to this document as numbered addenda, with the following subsections. For example, the first addendum will be labeled Addendum 1, and will have subsections as described below.

Scope of work: This section will be used to describe the task specific scope of work. Describe exactly what work will be performed. For example, soil samples will be collected using a Geoprobe.

Health and safety personnel: This section will be used to describe who will be responsible for HASP duties, and to specify changes in SSHC responsibilities from those specified in the main text of the HASP.

Field personnel: This section will be used to specify who will be performing fieldwork.

Initial Site entry: This section will be used to specify the initial levels of PPE to be used for the activities specified in the addendum.

Site hazards: This section will be used to specify Site hazards, chemical, physical, biological, or flammable in nature, which are not listed in the main text of the HASP. Include information derived from laboratory analyses that have been conducted related to the scope of work described in the addendum.

Site control: This section will be used to specify Exclusion Zones, Contamination Reduction Zones, and Support Zones which will be used during work at the Site.

Work practices and PPE: This section will be used to specify additional work practices not specified in Section 2.2. of the HASP. Also, specify the PPE that will be used during the field activities.

Monitoring: This section will be used to specify what monitoring equipment and action levels will be used during work specified in the addendum.

Other: This section will be used to specify changes or additions to other portions of the HASP.

Field Sampling Plan

FIELD SAMPLING PLAN

Former Sylvania Electric Products Incorporated Facility Cantiague Rock Road Hicksville, New York

GTE Operations Support Incorporated

June 2000 (revised September 2000)

Contents

1. Introduction

1.1. General

This document is a modified Field Sampling Plan (FSP) for the Supplemental Investigation of the Former Sylvania Electric Products Corporation Facility, 70 - 140 Cantiague Rock Road, Hicksville, New York (the Site). This FSP provides specific field procedures to be used during the implementation of the supplemental investigation activities. In addition to the Field Sampling Plan, the Supplemental Investigative Work Plan includes a Health and Safety Plan (HASP) as Appendix A and a Quality Assurance Project Plan (QAPP) as Appendix C. The FSP will be implemented in conjunction with the procedures, requirements, and methods set forth in the HASP and QAPP. The Work Plan, and therefore, the Field Sampling Plan, is intended to have sufficient flexibility to respond to field conditions. For example, soil-boring depths are anticipated to range from 4 to 20 feet below land surface (bls) but may be modified based on field conditions encountered. Furthermore, additional soil borings may be selected in the field in consultation with New York State Department of Environmental Conservation (NYSDEC), based on the subsurface conditions encountered.

1.2. Background information

The former Sylvania facility is in west-central Long Island, approximately one mile west of Hicksville, New York (Figure 1). Historically, the Site consisted of Lots 79 and 80 of Block 499, Section 11. The corporate genealogy prepared by GTE Operations Support Incorporated (GTEOSI) and detailed in the referenced Work Plan indicates that the Site was actively used by GTEOSI's predecessor companies in interest from about 1952 to 1966. The facility consisted of office and manufacturing buildings used to fabricate nuclear fuel elements. These buildings have been demolished, with the exception of a portion of the Air Techniques building at 70 Cantiague Rock Road. Process residuals, identified as liquids and particulates contained in and transported by the liquids, were reportedly discharged to on-Site recharge basins, leaching pools or cesspools. These residuals consisted primarily of metals (copper and uranium), acids, and the solvent tetrachloroethylene (GTEOSI 1996).

Presently, there are three businesses on-Site: Gilbert Displays, Inc. at 140 Cantiague Rock Road, Magazine Distributors at 100 Cantiague Rock Road and Air Techniques, Inc. at 70 Cantiague Rock Road. Greater than 95 percent of the Site is covered by buildings or pavement with only small areas of exposed soils.

In June and August 1999 over 100 soil borings were advanced at the Site. Soils were screened in the field for the presence or absence of radionuclides and possible volatile organic compounds (VOCs). Site soil sample results as reported in the *Final Investigative Report at Former Sylvania Electric Products Incorporated Facility* (O'Brien & Gere 2000) indicate above background concentrations of uranium, nickel, tetrachloroethene (PCE), and trichloroethene (TCE). Several areas were targeted by GTEOSI to be subject of further investigation. These areas are addressed in the Supplement to the Work Plan.

1.3. Objectives

The overall objectives of this FSP are to present the additional field investigation sampling locations, rationale for selecting the locations, methodologies to be used, and analytical requirements for the samples collected. The objectives of the field investigations will be to collect sufficient environmental data to:

- further define the nature and extent of residuals in the soils; and
- develop additional data that, when combined with existing data, can be used to evaluate the need for removal or remedial actions that are protective of human health and the environment.

2. General field investigation guidelines

2.1. Underground utilities

Both public and privately owned underground utilities, including electric, telephone, cable television, sewers and water will be identified prior to any drilling and sampling. The locations will be recorded in the Site field notes, surveyed and reviewed prior to initiating further drilling. Other potential on-Site hazards such as sharp objects, overhead power lines, building hazards and underground storage tanks will also be noted prior to sampling.

2.2. Sample identification

Each sample will be given an identification number or designation. Sample identification will be classified by matrix, location, depth (if applicable), name of the person collecting the sample, date, and time. Labels will be attached to each sample container.

2.3. Sampling equipment

The following is a general list of equipment necessary for record keeping, sample collection and logging, and decontamination:

- logbook or field sampling records;
- camera and film to document sampling procedures and sample locations;
- stakes, flagging tape, and paint to identify sampling locations;
- stainless steel spoons and bowls for mixing soil samples;
- sample bottles (kept closed and in the laboratory-shipped coolers until the samples are collected);
- chain-of-custody labels, tags, seals, and record forms;

- aluminum foil;
- reclosable plastic bags;
- driller's jars (for archiving samples);
- poly-sheeting;
- portable field instruments, including a photoionization detector (PID), radiation instruments, pH meter, conductivity meter and water level indicator; and
- a portable aerosol monitor (DustTrak);
- shipping labels and forms;
- packing/shipping material for sample bottles;
- tape (strapping, duct, and clear plastic);
- laboratory grade decontamination soaps (such as Alconox), reagent-grade solvents and decontamination water; and
- buckets, wash basins, and scrub brushes to be used for decontaminating equipment.

2.4. Field records

Information pertinent to the field investigation and/or sampling activities will be recorded in field logbooks. Field logbooks will be maintained to provide a daily record of significant events, observations, and measurements during the field investigation. Entries will be signed and dated. Entries in the logbook may include:

- name and title of author, date and time or entry, and physical/environmental conditions during the field activity.
- purpose and location of sampling activity;
- sample matrix (soil, sediment, ground water, air);
- sample collection method;
- number and volume of sample(s) taken;
- description of sampling point(s);
- preservatives used, if applicable;

- date and time of sample collection;
- sample identification number(s);
- sample distribution (NYSDEC, laboratory);
- field observations;
- soil field measurements (organic vapor, gross alpha, and gross beta); and
- water field measurements (pH, temperature, conductivity, and water level).

Original data recorded in field logbooks, sample labels and chain-of-custody records will be written in ink. If an error is made a correction will be made by placing a single line through the error, entering the correct information, and initialing and dating the correction. The erroneous information will not be erased. Field logbooks and copies of chain-of-custody forms will be maintained in the project file following completion of the fieldwork.

3. Field instruments

Field analytical equipment will be calibrated and tested to see if it is in good working condition immediately prior to each day's use and more frequently if required.

Volatile Organic Compounds Survey Instruments

The photoionization detector will be a PID (or equivalent), capable of ionizing and detecting compounds with an ionization potential of less than 10.2 eV. This accounts for approximately 70 percent of the volatile organic compounds on the NYSDEC ASP Target Compound List. The two main solvents previously detected at the Site, PCE and TCE have ionization potentials of 9.32 eV and 9.45 eV, respectively.

Calibration will be performed at the beginning of each day of use with a standard calibration gas (isobutylene) specified by the manufacturer. A battery check will be completed at the beginning of each working day. This information will be recorded in field logbooks and on the calibration log sheets.

Radiation Survey Instruments

Radiation survey instruments will be used to screen soil samples for radioactivity and monitor breathing zone levels for exposure to radioactive particles. Pre-operational checks shall be performed on radiation survey instruments including:

- annual calibration (note date from manufacturer);
- physical inspection;
- battery check;
- zero check;
- response time setting; and
- daily source checks.

Annual Calibration
The calibration sticker will be checked prior to use to ensure that the instrument is in current calibration. If the calibration sticker is missing or the calibration due date has passed, the instrument will be set aside and another instrument will be used.

Physical inspection
Each instrument will be inspected for evidence of physical damage or excessive dirt that could impair the proper operation of the instrument. Particular attention will be paid to the detector window and cable.

Battery check
A battery check will be completed at the beginning of each working day. The instrument function switch shall be left in the BATT position for a few minutes to allow potential residual charge decay. If erratic readings are experienced, the instrument will be replaced.

Zero check
The zero will be verified with the function switch in the OFF position. The operator will check that the meter needle is positioned over "0" or in the case of logarithmic scales, the lowest division. This may reveal possible damage to the meter movement or the shifting of the meter zero.

Response time setting
On instruments with a "response" knob, turn it to "fast" while searching and to "slow" while attempting to take accurate readings.

Daily Source Check
Each instrument will be source checked daily. A U-238 source (or other applicable gamma emitter) will be counted for a minimum of one minute on each instrument before use each day. A bracket or other fixture will be used to hold both the source and the instrument during the source check to provide a reproducible geometry. The observed counts will be recorded, and shall be within 10 percent of the standard value established during calibration.

Air monitoring survey instruments

The work area and the perimeter of the Site will be monitored for alpha particles using the DustTrak. The DustTrak detects the presence of total or respirable particulates through use of a laser photometer. A pump draws both solid and liquid particles through an optics chamber for measurement purposes. The instrument will be will be zeroed prior to each use and factory calibrated annually. Additional calibrations will be implemented as necessary in accordance with the operations manual.

Concentrations of solvents, PCE and TCE, will be monitored by wall mounted solvent badges. Procedures will be discussed in Section 5.3.

4. Equipment decontamination

The decontamination procedures that were presented in the March 1998 Investigative Work Plan's FSP (Appendix D) have been modified based on the field conditions encountered during the initial investigation in July 1999 (OBG 1998). Equipment and materials associated with sampling must be cleaned before and after use at the Site. Items such as drill rigs, auger flights, and miscellaneous equipment present potential sources of interference to environmental samples. These items may contact the materials to be sampled and may retain contaminants from other sources such as roadways or storage areas. They may also hold soil material from previous Sites that have not been removed. A central location at the Site will be established for decontamination of equipment.

Equipment does not need to be decontaminated between discrete investigation locations including individual soil borings since acetate liners are being used and no evidence of cross contamination was noted during the initial field investigation. All decontamination activities will be at the discretion of the Field Supervisor. If conditions are encountered in which the Field Supervisor deems decontamination is necessary, all appropriate procedures will be implemented.

5. Field investigation activities

Field activities will be performed while attempting to minimize disturbance to on-Site businesses and traffic patterns. The work will be conducted inside Gilbert Displays following vacancy of the building. Attempts will be made to conduct sampling at Magazine Distributors during off-hours. Samples will be screened in the field to aid in determining the need for additional areas of investigation, if applicable. On-Site and off-Site utilities, to the extent possible, will be identified for the health and safety of field personnel and to prevent damage to underground utilities during intrusive activities.

5.1. Supplemental soil investigation

Soil samples will be collected and analyzed to evaluate the vertical and horizontal extent of process residuals related to former Site use. Boring and field screening techniques will be the same as those used during the initial field investigation (summer 1999).

Approximately 55 soil borings are currently proposed and will be advanced as follows (Table 5-1 and Figure 2):

- Approximately 18 borings will be advanced inside of Gilbert Displays to evaluate the soils beneath the current building foundation. Sixteen of these borings will be used to further define the extent of impacted soils previously encountered on the east side of Gilbert Displays. The remaining two borings will be used to evaluate the historic leaching pool beneath the current building.
- Eleven borings will be advanced at the specific locations as requested by NYSDEC. These borings will further define the vertical and lateral extent of process residuals near SB-002 (2 borings), SB-003 (four borings), and SB-005 (five borings).
- Three borings will be advanced on the inside of Magazine Distributors, if possible. The borings will be to access the former leaching pools (LP-4, 7, and 8) and potential subsurface impacts from these leaching pools.
- Three borings will be advanced near SB-064, southeast of the former reservoir.

- One soil boring will be advanced on the south side of Magazine Distributors, southeast of SB-091, near an historic leaching pool (NYSDEC LP-13).

- Two borings will be advanced at the former locations of SB-75 and SB-76. These borings will be pushed directly to 20 feet bls to view the possible sediment layer and potential subsurface impacts from these former leaching pools (LP-9 and LP-10).

- Three borings will be advanced on the perimeter of SB-74 and one boring will be advanced east of and between SB-77 and SB-82. These areas are areas of potential impacts due to nickel.

- Two borings, SB-83 and SB-85 (AOC 11 and 12), will be advanced to define areas of elevated PID readings with depth.

- One soil boring will be advanced near SB-79 to evaluate metals and polychlorinated biphenyls (PCBs) in both the shallow and deep soils.

- Two borings will be advanced at the former leaching pool locations LP-14 and LP-15. These borings will be pushed to 20 feet bls, if possible, to view the "sediment layer" and potential subsurface impacts from these former leaching pools. Samples will be collected at both a shallow and deep interval (4 feet and 20 feet).

- Two shallow borings (approximately 4 feet bls) will be advanced near the electrical transformers on the south side of Magazine Distributors and one shallow boring will be advanced near SB-81. The borings will be used to evaluate the concentrations of PCBs in the shallow soils.

- Approximately five additional borings will be installed as necessary to further assess subsurface conditions. Specific locations will be based on field conditions encountered and will be discussed with NYSDEC.

With the exception of approximately six borings on the inside of Gilbert Displays that will be advanced with a dual purpose of environmental and geotechnical sampling, the remainder of the drilling will be conducted using direct-push drilling methodology (Geoprobe or equivalent), with a large diameter sampler, as in the initial investigation. Based on the previous direct push borings that have been performed at the Site, it may not be possible to advance the large diameter-sampling device (1.4") to the proposed depth. In these instances, a smaller diameter-sampling device (1.1") will be available. "The quantity of sample recovered using the small device will be limited. Consequently, in these cases, the proposed sampling parameters may have to be prioritized based on field screening results" (NYSDEC 2000).

In the event hard fill and rubble near the ground surface preclude the use of direct-push methodologies, the Geoprobe will be moved and a second attempt at the boring will take place. If two attempts are made and refusal is still encountered, the refusal will be noted in the field logbook and the field program will continue. Soil samples will be collected in two- or four-foot soil cores within an acetate sleeve. The soil core will start from the ground surface, proceeding to a depth dictated by the presence or absence of above-background levels of radioactivity, VOCs, underlying native material, or refusal.

Note: if the PID readings of the 20-foot core are greater than 100 ppm, attempts will be made to continue drilling. However, continuous sampling at 2-foot intervals below 20 feet may be excessive and may not be feasible. In these cases, samples will be collected at 5-foot intervals. Additionally, for the 18 borings beneath Gilbert Displays, "two borings will suffice to determine the vertical extent of VOC contamination if it is found to extend beyond 20 feet bls" (NYSDEC 2000).

Geotechnical borings will be advanced using the standard penetration test (SPT) to collect the number of blows per foot. The SPT uses a 2-inch split barrel sampler and an 140-pound hammer dropped 30 inches to drive the sampler in 6-inch increments. The SPT is used for construction, structural design, or remedial purposes.

An O'Brien & Gere scientist will be on-Site during the drilling and sampling operations to fully describe each soil core using the Unified Soil Classification System (USCS) and Wentworth Soil Classification System. Descriptions will include soil type, color, percent recovery, moisture content, odor, organic content and cohesiveness. The scientist will containerize two representative samples from each core. One sample will be placed into pre-cleaned four ounce sample container for laboratory analysis and a second placed into a glass container, covered with aluminum foil and sealed for PID headspace screening and archiving purposes. Both jars will be labeled with the Site name; boring number; sample interval; date; and time of sample collection.

Laboratory analysis includes radionuclide analysis, VOCs, Target Analyte List (TAL) metals, PCBs, and pH as summarized in Table 6-1. Headspace samples will be allowed to attain ambient temperatures prior to screening with the PID. Equipment and general procedural elements for radioactive core screening and soil sampling were provided in the March 1998 Investigative Work Plan's FSP, Appendix D (OBG 1998).

Both field observations and analytical data will be used to further define the vertical and lateral extent of residuals. Additionally, the data collected can be used to evaluate potential exposure pathways associated the former Site activities.

5.2. Soil vapor surveys

Objectives
The purpose of the soil vapor screening survey will be to supplement the data used to model indoor air and as an indicator of potential source areas. Soil vapor results will also indicate potential health and safety concerns for field workers.

Method
A soil vapor sample will be collected to screen for the presence of VOCs on a preliminary basis. VOC data will aid in the selection of additional soil boring locations, if applicable. If a boring indicates the presence of residuals, a soil gas sample will be collected. Additionally, a series of soil vapor points may be placed away from, but in close proximity to, the initial soil boring to evaluate the lateral extent of the residuals.

Data uses
The data collected in this manner will assist in locating future ground water collection locations, if applicable.

5.3. Air monitoring

Objectives
Indoor air samples will be collected and analyzed to evaluate potential ambient air solvent exposures to workers. The objective of the indoor air quality investigation is to gather data regarding the indoor atmosphere that may be affected by chemical substances previously used at this Site. The data will be compared to applicable occupational exposure data identified by the Occupational Safety and Health Administration (OSHA) as published in Title 29 of the Code of Federal Regulation, Part 1910 (29 CFR 1910).

Method
Three ambient air samples will be collected using 3M Organic Vapor Monitor Badges containing sorbent pads. The three badges will be placed following vacancy of the Gilbert Displays manufacturing building. The badges will be mounted in the front, middle and back portions of the building to obtain a representative exposure scenario. Although under normal-working conditions windows and access doors would be ajar, fans would be operating and a truck bay would be opened periodically during production, access doors and the truck bay will remain closed during monitoring at the request of the NYSDOH.

A sample data sheet will be used to document the sample location, sample designation, sample collection start and stop times, and any calibration data. Upon completion of sample collection, the badges will be prepared for shipment to an accredited laboratory. The samples will be analyzed by gas chromatography. Chain-of-custody documentation will be maintained through the analysis of the samples. The badges have a minimum detection limit of 8 micrograms per sample. However, the ppm results very based on exposure (time), which is used to obtain a time-weighted average.

Data uses

Results will be reported as airborne levels for specific VOC materials in milligrams per cubic meter of air. The individual VOC levels will be compared to specific permissible exposure level (PEL) values identified by OSHA for an 8-hour workday, 5-day per week exposure in an occupational environment and state regulatory levels. Gilbert Displays will be monitored as a worst case scenario at the Site due to the elevated concentrations of TCE and PCE adjacent to the east wall of the building. If concentrations of TCE and PCE are not detected above applicable air standards in Gilbert Displays, it will be assumed concentrations will be less than those that would be detected in Magazine Distributors.

5.4. Ground water investigation

Objectives

Six monitoring wells will be advanced to supplement current data on Site ground water conditions. In addition, one ground water sample will be collected from MW-1 to corroborate previous sampling results. Each assessable well will be gauged to obtain water levels to be used in a ground water contour map. Additionally, field parameters including pH, turbidity, temperature, and conductivity measurements will be taken from the well water.

Method

The six monitoring wells will be advanced using Rotosonic® drilling techniques (Figure 2). This drilling method uses an oscillating drill head to quickly advance through the subsurface providing a continuous 10-foot soil core and generating minimal cuttings. The core will be used to log both the soil profile and concentrations of constituents at depth, if any. Three of the wells are estimated to be completed to 80 feet bgs. The remaining three wills will be installed to approximately 160 feet bgs, based on the field conditions encountered.

Upon well completion, one water sample will be collected from each of the six new wells and one sample from MW-1. The well sampling will be conducted using low flow sampling techniques in accordance to procedures described in the Facility Investigation Work Plan (O'Brien & Gere 1998). The groundwater samples from the six new wells will be analyzed for VOCs, TAL metals, and radionuclides in accordance with the QAPP. The sample collected from MW-1 will be analyzed for the presence of nickel.

Ground water will be gauged and monitored using an interface probe and pH probe. The turbidity of ground water samples collected will be evaluated using a turbidity meter and minimized if possible. If turbidity is <50 NTUs, samples will be submitted to the laboratory for the appropriate analysis. If turbidity of the samples >50 NTUs, then both filtered and unfiltered metal and radioactivity samples will be collected and analyzed. Samples will be filtered through 0.45-micron filter.

Data Uses

Ground water sampling will be used to evaluate ground water concentrations, potential Site sources and potential exposure pathways that may affect public health.

6. Analytical program

The analytical program has been designed to further define the chemical and radioactive constituents associated with historic Site activities. Table 6-1 presents a summary of the analytical program for the Former Sylvania Electronics Products Corporation Facility.

Table 6-1 Analytical Summary Program

Field Task	Rationale	Analyses	Environmental Samples**	QC Samples		
				Field Duplicates	Trip Blanks	MS/MSD
soil samples chemistry	quantify process residuals formerly used at the Site. verify unaffected soils	VOCs TAL Metals* Nickel PCBs pH	+/- 55 15 49 19 11	3 1 3 1 1	7	3 / 3
soil samples radionuclides	quantify process residuals formerly used at the Site.	gamma spec. alpha spec.	55 7	3 1		3/3
water sample	quantify Nickel in MW-1 Six new wells	Nickel pH VOCs, RAD# TAL Metals*	1 5 6	0	0	0
air samples	verify ambient air content	PCE/TCE	3	1	0	0

Notes:

- Analyses for radionuclides may include thorium 230, 232, uranium 234, 235, 238, and radium. Field duplicates will be collected at an appropriate rate of one duplicate for each 20 samples. If possible, depending on the sample volume available, matrix spikes will also be collected at a rate of 1 per 20 for thorium and uranium isotopic analyses. Soils analyzed by Alpha Spec will target either radium or uranium and thorium.
- Based on previous analytical results, the soils will not be analyzed for SVOCs.
- *TAL metals - aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.
- **The actual number of samples will vary depending upon the field conditions encountered and the number of borings necessary to delineate any process residuals that are found during the investigation.
- # - If gross alpha/beta exceed criteria, samples will be run for radium and possibly uranium 238.

Laboratory analyses of environmental samples will be conducted in accordance with the NYSDEC 1995 Analytical Services Protocol (NYSDEC 1995 ASP). The QAPP presents the analytical methods and quality control objectives to be used during the field investigation. Additionally, multiple samples may be collected from cores that exhibit greater than 200 ppm on the PID during field scanning.

References

GTE Operations Support Incorporated (GTEOSI). 1996. Data Supplied by GTEOSI. Former Sylvania Site, Hicksville, New York.

New York State Department of Environmental Conservation. 1995. Analytical Services Protocol.

New York State Department of Environmental Conservation. 2000. *Comments on the Draft Summary Table*. August 16, 2000.

O'Brien & Gere Engineers, Inc. 1998. Work Plan. Former Sylvania Electric Products, Inc. Facility, Hicksville, New York. March 1998 (revised May 1998).

O'Brien & Gere Engineers, Inc. 2000. Final Investigative Report Former Sylvania Electric Products, Inc. Facility, Hicksville, New York. January 2000 (revised August 2000).

United State Environmental Protection Agency (USEPA). 1988. Interim Final - Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.

Table 5-1
Supplement to the Approved Work Plan Scope of Work

Soil Borings	No. of Borings	Boring Depth	Sample Depth(s)	Gamma Spec.	Alpha Spec.	Field Scan	VOCs'	Nickel Only	TAL Metals	TCLP	pH	PCBs	Reason
Supplemental Scope													
inside Gilbert Displays	18	20	4 to 20'	16		18	~8	16	2		3*	1	evaluate beneath the current foundation
inside Gilbert Displays (LPs)	--	20	4 to 20'	2		--	~2		2			2	2 leaching pool locations
near SB-02	2	20	4 to 20'	3		2	~2	2					vertical and lateral extent of process residuals
near SB-03	4	20	4 to 20'	3		4	~4	4					vertical and lateral extent of process residuals
near SB-05	5	20	4 to 20'	5		5	~5	. 5					vertical and lateral extent of process residuals
inside MDI (LP-4 and 7)	2	20	4 to 20'	2		2	~2	0	2		2*	2	2 leaching pool locations
near SB-64	3	20	4 to 20'	3		3	~3	3			1*		southeast of the former reservoir
SE of SB-91 (LP-13)	1	20	4 to 20'	1		1	~1		1			1*	historic leaching pool area (NYSDEC LP-13)
Field Determinations	0 - 5	20	TBD	0 - 5	7	0 - 5	0 - 5	0 - 5		1			In the Supplement to the Work Plan page B-12
QA/QC	--	--	TBD	9	1	--	~12	3	1		1	1	Blanks, duplicates, MS/MSD
Additional Scope 8/9/2000*													
SB-75 & 76 (LP-9 & LP-10)	2	20	4 to 20'	2**		2	~2		2		1	2	possible sediment layer in former leaching pools
SB-83 & SB-85	2	20	4 to 20'	2**		2	~2	2					
inside MDI (LP-8)	1	20	4 to 20'	1**		1	~1		1			1	leaching pool area
LP-14	1	20	4 & 20'	1**		2	~2		1			2	PCBs at 4' and 20' (sediments) in leaching pools
LP-15	1	20	4 & 20'	1**		1	~1		1			1	leaching pool
East between SB-77 & SB-82	1	20	4 to 20'	1**		1	~1	1			1	1	elevated concentrations of Nickel
near electrical transformer	2	4	4 to 20'	2**		2	~2	2				2	PCBs near transformer in shallow soils
SB-79	1	20	8', 20'	1**		2	~2	2			2	2	area of metals, shallow and deep PCBs
SB-81	1	5	5'	1**		1	~1	1				1	area of PCBs
near SB-74	3	20	4 to 20'	3**		3	~3	6	3		1	1	area of Nickel
QA/QC	--	--	TBD	--	--	--	~4	--				--	--
Water	**No.**												**REASON**
MW-01	1							1			1		Nickel in water (turbidity <50 NTUs)
MW-02 through MW-05											1		Collect depth to water and pH measurement
Air	**No.**												**REASON**
Inside Gilbert Displays	3												PCE/TCE (front, middle, and back)
QA/QC	1												duplicate

Notes:

- All depths are in feet
- Analytical methods are provided in the work plan
- TBD - To be determined
- * Added at or following the 8/9/2000 meeting
- An attempt will be made to advance all borings to 20 feet below ground surface unless field conditions dictate otherwise
- ' At least one sample/boring if PID readings are >50ppm. For readings >200 multiple samples will be collected for VOCs
- ** In lieu of alpha/beta spectrometry, 1 gamma spec. analysis has been added to each boring added at the 8/9/00 meeting
- With the exception of SB-75 & 76, the borings will be field screened continuously from surface to boring termination

APPENDIX C

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN

Former Sylvania Electric Products Incorporated Facility Cantiague Rock Road Hicksville, New York

GTE Operations Support Incorporated

May 2000 (revised September 2000)

Contents

List of tables

1. Introduction

This Quality Assurance Project Plan (QAPP) has been developed by O'Brien & Gere Engineers, Inc. (O'Brien & Gere) for GTE Operations Support Incorporated (GTEOSI). The QAPP provides quality assurance/quality control (QA/QC) criteria for work efforts associated with sampling of environmental media at the former Sylvania Electric Products Incorporated Facility (the Site) in Hicksville, New York. This QAPP is one component of the Supplement to the Approved Work Plan, which also includes a Health and Safety Plan and Field Sampling Plan.

This document has been prepared in accordance with the New York State Department of Environmental Conservation's (NYSDEC) RCRA Quality Assurance Project Plan Guidance (NYSDEC 1991) and the United States Environmental Protection Agency's (USEPA's) Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (USEPA 1980a).

This QAPP will assist in generating data of a known and acceptable level of precision and accuracy. The QAPP provides information regarding the project description and personnel responsibilities, and sets forth-specific procedures to be used during sampling of relevant environmental matrices, other field activities, and analyses of data.

The following quality assurance topics are addressed in this plan:

- Project organization and responsibilities;
- QA objectives for data measurement;
- Sampling procedures;
- Documentation and chain-of-custody;
- Calibration procedures;
- Sample preparation and analytical procedures;
- Data reduction, usability, and reporting;
- QA/QC checks;
- Performance and system audits;

- Preventative maintenance;
- Data assessment procedures;
- Corrective actions; and,
- QA reports to management.

The remainder of this document provides details on these topics.

2. Project organization and responsibilities

While each person involved in the investigation and generation of data is implicitly part of the QA program for the project, certain individuals have specifically designated responsibilities. Within O'Brien & Gere, these are the Project Officer, Project Manager, Field Supervisor, QA Officer, Data Evaluators, and Sampling Personnel. O'Brien & Gere Laboratories, Inc. of Syracuse, New York will provide analytical services for the investigation. Laboratory personnel with QA/QC responsibilities include the laboratory QA Coordinator and Sample Custodian.

2.1. Project officer

The Project Officer is Swiat Kaczmar, Ph.D, CIH. Dr. Kaczmar will be responsible for the overall corporate management of the investigation and for the completion of work specified in the Work Plan. It will be his responsibility to provide for the allocation of staff and other resources required to complete the project within the specified schedule and budget.

2.2. Project manager

The Project Manager is Jeffrey Banikowski, CPG, LSP. Mr. Banikowski will have responsibility for the implementation and completion of each of the tasks identified in the Work Plan. He will manage the technical and administrative aspects of the project and function as the firm's principal client contact for the project.

2.3. Field operations supervisor

The Field Supervisor is Pam Cox. Ms. Cox will be responsible for day to day field operations including oversight of soil coring operations, sample collections, mobilization and demobilization activities, and overall in-field coordination with subcontractors, regulatory agencies, and property owners.

2.4. QA officer

The QA Officer is Stuart Spiegel. Mr. Spiegel will be responsible for overall project QA. He will review project plans and revisions to such plans to maintain proper QA throughout the investigation. In addition, the QA Officer will be responsible for performance and system audits, data processing activities, data processing QC, data quality review, corrective actions, and coordinating the QA/QC efforts between O'Brien & Gere and the laboratory.

2.5. QA/QC summary report

The data evaluator will be Karen Storne. Ms. Storne will be responsible for reviewing chemical data and validating laboratory analytical data. The data usability summary report (DUSR) will be completed and submitted to the QA Officer for review. The QA Officer will have overall responsibility for data evaluation.

2.6. Sampling personnel

Sampling tasks required by this investigation will be conducted by experienced chemists, engineers, geologists, hydrogeologists, and environmental technicians. Their responsibilities will include the documentation of sample collection protocols, sample collection, equipment decontamination, and chain-of-custody documentation.

Each sampling team will be organized under a team leader. In addition to the responsibilities above, team leader responsibilities include the initializing and accurate verification of field notebooks, chain-of-custody records, sample labels, and other field-related documentation.

2.7. Laboratory QA coordinator

The laboratory QA Coordinator will be responsible for the laboratory's QA/QC activities associated with the project. The specific duties of the laboratory QA Coordinator include determining whether analyses are conducted within the appropriate holding times and that laboratory custody procedures are followed. Moreover, the laboratory QA Coordinator monitors daily precision and accuracy records, maintains detailed copies of all procedures, reschedules analyses based upon unacceptable data accuracy or precision, and identifies and implements corrective actions necessary to maintain QA standards.

The laboratory QA Coordinator or his or her designee will conduct initial usability and assessment of analytical data results and report the findings directly to the QA Officer.

2.8. Sampling custodian

The Sample Custodian's responsibilities include verifying proper sample entry, sample handling procedures (documentation of the preparation and analysis of samples) by laboratory personnel, receipt of samples at proper temperature, record package integrity upon receipt, and verify and maintain the chain-of-custody.

3. Data quality objectives

3.1. Objectives

Data quality objectives (DQOs) are both quantitative and qualitative statements specifying the quality of the environmental data required to support the decision making process. DQOs define the total acceptable uncertainty in the data for each specific activity conducted during the investigation. The uncertainty includes both sampling error and analytical error. Although ideal, zero uncertainty is the intent. However, the variables associated with the process (field and laboratory) inherently contribute to the uncertainty of the data. The overall objective is to keep the total uncertainty within a range that will not hinder the intended use of the data. The QA/QC requirements have been established such that there will be a high degree of confidence in the measurements.

The principal DQOs of this investigation are to generate data of sufficient quality to support both qualitative and quantitative conclusions concerning the evaluation of the nature and extent of process residuals at the Site, and to support a human health exposure evaluation. In order to achieve these DQOs, the process of data generation was designed to develop a body of analytical data of sufficient quality to be used to support conclusions made as a result of this investigation. Specific data quality requirements such as criteria for precision, accuracy, representativeness, completeness, comparability, and sensitivity are specified in this document.

Laboratory analyses and analytical levels will adhere to the guidelines described in USEPA's Data Quality Objectives for Remedial Response Activities (USEPA 1987). Analytical levels are defined in the guidance document as follows:

- Level I implies field screening or analysis using portable instruments. Results are often not compound specific and not quantitative but results are available on a real-time basis.

- Level II implies field analyses using more sophisticated portable analytical instruments. In some cases, the instruments may be set up in a mobile laboratory on-Site. There is a wide range of the quality of data that can be generated for Level II analyses. In general, data quality depends on the use of suitable calibration standards, reference materials, sample preparation equipment, and training of the instrument operator. Results are available on a real-time basis or within several hours.

- Level III implies that all analyses is performed in an off-Site laboratory. Level III analyses may or may not use USEPA Contract Laboratory Program (CLP) procedures or a CLP laboratory, but may not use documentation procedures required of Level IV analyses. Level III analyses can provide data of the same quality as Level IV, but USEPA Methods such as Test Methods for Evaluating Solid Waste (SW-846) (USEPA 1996) are used instead of CLP methods.

- Level IV implies CLP routine analytical services (RAS). All analyses are performed in an off-Site CLP analytical laboratory following CLP protocols. Level IV is characterized by rigorous QA/QC protocols and documentation.

- Level V implies analyses by non-standard methods. All analyses are performed in an off-Site analytical laboratory, which may or may not be a CLP laboratory. Method development or method modification may be required for specific constituents or detection limits. CLP special analytical services (SAS) are Level V.

Table 3-1 contains sampling efforts, objectives, analyses, data uses, and analytical levels. The remainder of this QAPP describes the specific approaches that will be taken to achieve the required DQOs.

In order to assess adherence to DQOs, O'Brien & Gere has developed the QA/QC program described herein. The USEPA states that the purpose of a QA/QC program "is the definition of procedures for the evaluation and documentation of sampling and analytical methodologies and the reduction and reporting of data. The objective is to provide a uniform basis for sample collection and handling, instrument and methods maintenance, performance evaluation, and analytical data gathering and reporting" (USEPA 1987). NYSDEC's, guidance document for QAPPs, states that "quality assurance is a management system for ensuring that all information, data, and decisions resulting from an investigation are technically sound, and properly documented" (NYSDEC 1991). QC is defined as the "functional mechanism through which QA achieves its goals." This QAPP is consistent with the requirements set forth by the NYSDEC's RCRA Quality Assurance Project Plan Guidance (NYSDEC 1991).

Table 3-1. *Sampling efforts, objectives, analyses, data uses, and analytical level.*

Sampling effort	Objective	Types of analysis	Data uses	Analytical level
Soil boring sampling	Quantify process residuals formerly used at the Site, if any	VOCs metals pH PCBs radionuclides	Worker health and safety, and support human exposure assessment	I, II and III
Air Sampling	Quantify concentrations of PCE and TCE in the ambient air, if any	PCE / TCE	Worker health and safety, and support human exposure assessment	I and II

Note: VOCs - volatile organic compounds
PCBs – polychlorinated biphenyls
Metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc
Radionuclides may include alpha spectroscopy and gamma spectroscopy on a sample specific basis.

The following is a brief description of the data quality parameters addressed in the QAPP and is specific to chemical analytes.

Precision describes the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements that have been made in an identical manner, compared to their average value. Precision can be expressed in a variety of manners, including absolute methods such as deviation from the mean or median values, standard deviation and variance, or relative methods, such as relative deviation from the mean or median. The overall precision may be established through the analysis of field and laboratory duplicate samples. For this project, a DQO goal for precision has been established that 80 percent of the chemical analytes must meet the established criteria. If this goal is met, the data will have acceptable precision and will be considered usable. If this goal is not met, appropriate corrective actions will be taken.

Accuracy is defined as the degree of difference between measured or calculated values and the true value. The closer the numerical value of the measurement comes to the true value, or actual concentration, the more accurate the measurement. Accuracy is expressed in terms of absolute or relative error. Accuracy will be determined through analysis of spiked samples and standards with known concentrations. An overall project DQO goal for accuracy has been established that 80 percent of the analytes must meet established accuracy criteria. If this goal is met, the data will be considered accurate and usable. If this goal is not met, appropriate corrective actions will be taken.

Representativeness refers to the degree to which a sample taken from a Site accurately reflects the matrix at the Site. This qualitative parameter, is most concerned with the design of the sampling program. Factors that should be considered in the determination of representativeness include appropriateness of sampling and analytical methodologies, representativeness of the selected media, and representativeness of the selected analytical procedures. Representativeness will be achieved by the use of procedures for the collection and preservation of samples as described in the methods, the NYSDEC's RCRA Quality Assurance Project Plan Guidance (NYSDEC 1991), the Work Plan, and this QAPP.

Comparability refers to the use of consistent procedures, second source reference standards, reporting units, and standardized data format with document control. Adherence to standard procedures and the analysis of external source standard materials maximizes the probability that data generated from a particular method at a given laboratory can be validly compared to the data of another. This QAPP has been written to provide data that will be comparable to other data collected, as standard methods will be used for this investigation.

Completeness refers to the process of obtaining the required data as outlined in the Work Plan. Completeness is also defined as the percentage of measurements judged to be useable. Samples for which the critical data points fail completeness objectives will require reanalysis of (within the specified holding times) until the DQOs are met. The completeness goal has been specified at 90 percent for this investigation.

Sensitivity refers to a measurable concentration of an analyte that has an acceptable level of confidence. Method detection limits (MDLs) are the lowest concentration of an analyte that can be measured with 99 percent confidence that the analyte concentration is greater than zero. Practical quantitation limits (PQLs) and/or reporting limits (RLs) are levels above the MDLs at which the laboratory has demonstrated the quantitation of analytes. The chemical analytical methods associated with this project have MDLs, PQLs, and RLs at sufficiently low levels to adequately assess the project DQOs.

For radiochemical analyses, detection levels are estimated based on the characteristics and observations of the analyses of a given sample and are, therefore, sample based. Here detection levels are referred to as minimum detectable concentrations.

3.2. Field sampling

The objective of field sampling procedures is to obtain samples that represent the environmental matrix being investigated. This will be accomplished through the use of proper sampling techniques and equipment as presented in the NYSDEC's RCRA Quality Assurance Project Plan Guidance (NYSDEC 1991), where applicable. Appropriate sampling techniques are presented in the Work Plan.

3.3. Laboratory analyses

To obtain data of a quality sufficient to meet the applicable project DQOs, the following methods will be performed:

- Volatile Organic Compound (VOC) analysis by gas chromatography/mass spectrometry (GC/MS);
- Metal analysis by inductively coupled plasma (ICP); and
- Radionuclide analysis by alpha spectroscopy and gamma spectroscopy, on a sample specific basis.

The specific methods, analytical QA/QC, and data reporting will adhere to the analytical methods listed in Table 3-2 along with NYSDEC Analytical Services Protocol (ASP) 10/95 revisions, Exhibit E requirements as applicable to chemical as well as radiochemical analyses (NYSDEC 1995b).

Table 3-2. *Analytical methods*

Parameter	Analytical method	Reference
VOCs	SW-846 Method 8260B	1
Metals	SW-846 Method 6010B	1
PCBs	SW-846 Method 8082	1
pH	Method 9045C (revision 3);	1
Thorium 228, 230, 232	EML TH-01 Modified	3
Uranium 234, 235, 238	EML U-02 Modified	3
Gamma Spectroscopy	LANL ER-130 Method 901.1 (Modified)	2

Note VOCs - volatile organic compounds
PCBs – polychlorinated biphenyls
Metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.
References:
1- *Test Methods for Evaluating Solid Waste, 3rd Edition*. Washington, D.C. USEPA, 1996.
2 - *Health and Environmental Chemistry: Analytical Techniques, Data Management, and Quality Assurance*, LA-10300-M, Vol. II, Los Alamos National Laboratory (LANL), Los Alamos, New Mexico, May 1986, revised March 1995.
3 – Environmental Measurements Laboratory (EML) Procedures Manual, 27th Edition, Volume 1, U.S. Department of Energy, New York, New York, November 1990.

4. Sampling procedures

4.1. Objectives

Sampling procedures and practices that will be used in the investigation are presented in the Work Plan. Information will be obtained as to the identity, location, and extent of residuals in the soil boring and surface soil samples as defined in the Work Plan.

4.2. Sampling locations

Sampling locations for the investigation are presented in the Work Plan.

4.3. Field QA/QC samples

In order to evaluate data quality, QA/QC samples will be collected during the field investigation. Table 4-1 lists the environmental and corresponding QC samples to be collected by analyses and matrix type. The discussion of field QA/QC samples is directed largely to samples collected for chemical analyses.

4.3.1. Field duplicate samples

Collection of field duplicate samples provides for the evaluation of the laboratory's performance by comparing analytical results of two samples from the same location (Table 4-1). Field duplicate samples are also collected to evaluate field sample collection procedures. Field duplicate samples are duplicate samples collected from one location and sent to the laboratory blind (with two different sample identifications). One field duplicate sample will be collected for every 20 environmental samples (i.e. frequency of five percent).

4.3.2. Matrix spikes and matrix duplicates, matrix duplicates

For chemical analyses, matrix spike/matrix spike duplicate (MS/MSD) samples are duplicate samples that have spiking solutions added. MS/MSD samples are considered identical to the original sample and require that the sampled material be homogenized in the field and laboratory prior to analyses. Due to the potential loss of volatile organic compounds (VOCs) during homogenization, samples collected for VOCs analyses will not be homogenized in the field. Since they will not be homogenized, field samples must make every effort to collect representative samples of the location sampled for VOCs. The percent recovery of the spiked amount indicates the accuracy of the extraction as well as interference caused by the matrix. Relative percent difference (RPD) between spike sample recoveries will indicate the precision of the data. One MS/MSD sample set will be collected for every 20 environmental samples submitted to the laboratory (i.e. frequency of five percent).

For radiochemical analyses, matrix duplicate (MD) analyses will be performed according to the following criteria. A Relative Error Ratio (RER) less than two for 80 percent of the total radiochemical measurements and less than 3.5 for all measurements will be considered acceptable. An RER is a measure of precision, which is dependent of the actual analyte concentration being measured. The RER may be calculated as:

$$RER = \frac{R_1 - R_2}{\sqrt{TPU_{1(1\sigma)}^2 + TPU_{2(2\sigma)}^2}}$$

where: R_1 = analytical sample result
R_2 = analytical duplicate result
$TPU_{(1\sigma)}$ = 1 sigma total propagated uncertainty for sample (1) or duplicate (2)

In addition, for alpha spectrometry measurements, each sample will be spiked with appropriate tracers to evaluate recovery.

4.3.3. Field blanks/equipment blanks

Field blanks/equipment blanks will consist of samples of analyte-free water that are passed through and or over decontaminated sampling equipment. One equipment blank will be collected per set of sampling equipment per sampling event. Field/equipment blanks will not be required if dedicated sampling equipment is used. The field/equipment samples will be subject to the same analyses as the environmental samples.

4.4. Sampling procedures

Protocols for the various sampling activities are described in detail in the Work Plan.

4.5. Sample preparation and preservation

Immediately after collection, samples will be transferred to labeled sample containers and properly preserved. Table 4-1 lists the proper sample containers, volume requirements, and preservations. Samples requiring refrigeration for preservation will be promptly transferred to coolers packed with ice or ice packs. Samples will be shipped or transported within 24 hours of being collected and will arrive at the laboratory no later than 48 hours after sample collection. Proper chain-of-custody documentation will be maintained as discussed in Section 5 of this QAPP. Samples will be extracted, digested and/or analyzed within the holding times specified in Table 4-1.

5. Sample custody

Chain-of-custody procedures will be instituted and followed throughout the investigation. These procedures include field custody, laboratory custody, and evidence files. Samples are physical evidence and will be handled according to strict chain-of-custody protocols. The QA Officer must be prepared to produce documentation that traces the samples from the field to the laboratory and through analyses. The USEPA has defined custody of evidence as follows:

- actual possession;
- in view after being in physical possession;
- in a locked laboratory; or
- in a secure, restricted area.

QA measures will begin with the sample containers. Pre-cleaned sample containers will be purchased from an USEPA-certified manufacturer (I-Chem 200 or equivalent).

Chain-of-custody records will be kept starting in the field when sample collection is completed. In the field logbook, samplers will note climatic data and equipment employed during collection. Physical characteristics of the sample, date, time of day, sample location, and any abnormalities noted during sampling will be recorded.

The field sampler will indicate the sample identification number, date, time, sample matrix, sample type (i.e. grab or composite), number of containers and the analysis requested on the appropriate chain-of-custody form. The chain-of-custody form will be signed and placed in a sealed ziploc bag in the cooler. An example chain-of-custody form is included as Figure 5-1. The shipping container will be closed, and two paper or plastic seals will be affixed to the latch and lid and the field sampler will initial the seal. The seals must be broken to open the cooler and will indicate tampering if the seal is broken before receipt at the laboratory. The cooler will be shipped via an overnight delivery service or hand delivered to the laboratory at the conclusion of each day of sampling activities. When the samples arrive at the laboratory, the sample custodian will sign the vendor's air bill or bill of lading (unless hand-delivered). If shipped, the shipping label will be attached to the chain of custody. If samples are hand delivered by the sampler, the cooler does not need to be sealed.

Figure 5-1. *Example chain-of-custody*

Project Name ____________
Job No. ____________
Sheet ____ of ____

Office: ____________
Address: ____________
Phone: ____________

CHAIN OF CUSTODY

CLIENT:	COLLECTED BY:
LOCATION:	(Signature)

SAMPLE DESCRIPTION/LOCATION	Date	Time	Sample Matrix[1]	Sample Type[2]	No. of Containers	ANALYSIS REQUESTED/COMMENTS[3]

[1] Matrix = air, sludge, sediment, etc. VOC - SW8260A; SW8270B; TAL - SW6010A[2] Type = grab, composite

	Date	Time		Date	Time
Relinquished by: ____________ of: ____________			Received by: ____________ of: ____________		
Relinquished by: ____________ of: ____________			Received by: ____________ of: ____________		
Relinquished by: ____________ of: ____________			Received by: ____________ of: ____________		
Use this space if shipped via courier (e.g., Fed Ex) Relinquished by: ____________ of: ____________			Courier Name: ____________ *Attach delivery/courier receipt to Chain of Custody		
Relinquished by: ____________ of: ____________			Received by: ____________ of: ____________		

The sample custodian's duties and responsibilities upon sample receipt will be to:

- Document receipt of samples;
- Inspect sample shipping containers for the presence or absence of custody seals (only if shipped via overnight courier) and for container integrity;
- Sign the appropriate forms or documents, verify and record the agreement or disagreement of information on sample documents and, if there are discrepancies, record the problem and notify the QA Officer;
- Label sample with laboratory sample number; and
- Place samples in secure, limited-access storage.

At the laboratory, the analysts will be required to log samples and extracts in and out of storage as the analysis proceeds. Samples and extracts will be returned to secure storage at the close of business. Written records will be kept of each time the sample or extract changes hands. Care must be exercised to properly complete, date, and sign items needed to generate data. Copies of the following will be stored for incorporation into the sample file:

- Documentation of the preparation and analysis of samples, including copies of the analyst's notebooks;
- Bench sheets, graphs, computer printouts, chromatograms, and mass spectra, as applicable;
- Copies of QA/QC data;
- Instrument logs showing the date, time, and identity of the analyst; and
- Analytical tracking forms that records the date, time, and identity of the analyst for each step of the sample preparation, extraction, and analysis.

Upon completion of the analyses, the QA Officer or his designee will begin assimilating the field and laboratory notes. In this way, the file for the samples will be generated. The final file for the sample will consist of laboratory data packages, including summary and raw data from the analysis of environmental and QC samples, chromatograms, mass spectra, calibration data, work sheets, sample preparation logs, and chain-of-custody records.

6. Calibration and frequency

6.1. Laboratory equipment calibration

Proper calibration of laboratory analytical instrumentation is essential for the generation of reliable data that meets the project's DQOs. Analytical instrument calibration is monitored through the use of control limits that are established for individual analytical methods. Calibration procedures to be followed are specified, in detail, as listed in the analytical methods and in NYSDEC ASP 10/95 revisions, Exhibit E (NYSDEC 1995b). These procedures specify the calibration materials to be used and the type, range, and frequency of calibration.

The laboratory will be responsible for proper calibration and maintenance of laboratory analytical equipment. Calibration procedures are presented in the analytical methods and the laboratory QA Manual. The following subsections detail some of the calibration procedures outlined in the analytical methods and the laboratory QA Manual.

6.1.1. Gas chromatography/mass spectrometry (GC/MS)

Before the GC/MS is calibrated, the mass calibration and resolutions of the instruments are verified by a 50-ng injection of 4-bromofluorobenzene (BFB) for VOCs. The tune must meet the ion abundance criteria specified in the analytical method. The system must be verified every 12 hours of analysis and when the instrument performance check solution fails to meet criteria. After re-tuning, the performance check solution is reanalyzed. Samples are not analyzed until tuning criteria are met.

An initial five-point calibration is performed for the target compounds prior to start-up and whenever system specifications change or if the continuing calibration acceptance criteria have not been met. One of the calibration standards must be at a concentration between one and five times reporting limits. The relative response factors (RRFs) and percent RSD of specific compounds must meet established criteria as specified in the method. If these parameters fail to meet criteria, corrective actions must be implemented and the initial calibration must be repeated.

A midpoint continuing calibration standard containing the target compounds is analyzed at the beginning of every 12-hour period following the GC/MS tune. This standard must meet specific QC limits listed in the method to verify that the initial five-point calibration is still valid.

6.1.2. Metals

Instrument calibration for metal analyses is performed daily. A two-point calibration for inductively coupled plasma (ICP) analyses and a five-point curve is performed for spectrophotometers and graphite furnace. The calibration curves must have correlation coefficients greater than or equal to 0.995. Calibration verification is monitored by analyzing a calibration verification standard and a calibration blank following calibration, every ten samples, and at the end of the analytical sequence. The calibration verification standard recovery must be within 90 percent to 110 percent for all metals or the instrument must be resloped and, if necessary, recalibrated. The calibration blank must not contain target compounds at concentrations greater than the reporting limits or corrective actions are implemented. To verify inter-element and background corrective factors for ICP analysis, interference check samples (ICSA and ICSAB) must be analyzed at the beginning and end of the analysis sequence or a minimum of twice per eight hours. The percent recoveries for ICS solutions must be within 80 percent to 120 percent or corrective actions must be implemented. In addition, for ICP analyses, a serial dilution analysis must be performed per sample matrix. If the analyte concentration is greater than fifty times the instrument detection limit (IDL) in the original sample, a serial dilution (five-fold dilution) must agree within ten percent of the original determination. Detection limits, inter-element corrective factors, and linear ranges must be established at the frequency specified in the method.

6.1.3. Radionuclides

For isotopic analyses, on an annual basis, NIST-traceable sources are used for determining detector efficiencies of solid-state detectors. These efficiencies are checked weekly using non-NIST standards. The check source data are only used to verify reproducibility of the detectors. On a quarterly basis, system amplifiers are calibrated to align source energies into calibrated sources. The reproducibility of the energy calibrations is checked weekly. Peak resolution checks are performed on a daily basis using electronic pulsars. The resolutions are determined to not exceed 100 keV FWHM. System backgrounds are determined weekly and subtracted from sample results. Calibration sources will contain a mixture of alpha emitters giving well-separated peaks that cover the region from 2 to 4 meV.

For field isotopic analyses the manufacturer will initially calibrate equipment. During the investigation, the working condition of the equipment will be evaluated using check sources at the beginning and ending of each day's work using standardized check sources.

6.2. Standards and solutions

The use of standard materials of a known purity and quality is necessary for the generation of reproducible data. The laboratory will monitor the use of laboratory solutions, standards, and reagents. Standards and solutions are obtained from the USEPA or USEPA-certified commercial vendors. Standard reference materials and performance evaluation materials are obtained from the NIST or USEPA-certified commercial vendors.

Standards and solutions are verified prior to use. This verification may be in the form of a certification from the supplier, comparison to a standard curve, or another standard from a separate source. Standards are routinely checked for signs of deterioration, including unusual volume changes, discoloration, formation of precipitates, or changes in analyte response.

Solvent materials are also verified prior to use. Each new lot of solvent is analyzed to verify the absence of interfering constituents. Reagent and method blanks are routinely analyzed to evaluate possible laboratory-based contamination of samples.

6.3. Records

A record book will be kept for standards and will include the following information:

- Material name;
- Control or lot number;
- Purity and/or concentration;
- Supplier/manufacturer;
- Receipt/preparation date;
- Recipient's/preparer's name; and
- Expiration date.

These records will be checked periodically as part of the laboratory internal laboratory controls review.

6.4. Equipment

Each major piece of analytical laboratory instrumentation that will be used on this project has been documented and is on file with the laboratory. An equipment form will be prepared for each new purchase and old forms will be removed from the instrument area and filed when an instrument is replaced.

The laboratory will be required to maintain an equipment form detailing both preventative maintenance activities and the required QA testing and monitoring. In the event the instrument does not perform within the limits specified on the monitoring form, the Laboratory Manager will be notified and a decision will be made as to what corrective action is necessary. The corrective action procedure shall be documented in the instrument log. If repair is necessary, an "out-of-order" sign will be placed on the instrument until repairs are completed. Repairs made to the instrument will be documented in the instrument logbook. Required QA/QC testing and monitoring will be completed prior to the resumption of sample analysis.

6.5. Calibration records

A bound notebook will be kept with each instrument that requires calibration. The notebook will contain a record of activities associated with QA monitoring and instrument repairs. These records will be checked during periodic equipment review and internal and external QA/QC audits.

7. Analytical procedures

The accuracy and precision of the analytical data generated by the laboratory will be determined through the analysis of duplicate, spiked, reference, laboratory control, and field and laboratory blank samples. Interferences will be identified, documented, and acted on by the laboratory to achieve the specified detection limits. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument. The selection of analytical cleanup methodologies will follow method requirements. In such cases, the laboratory QA Coordinator will document that the laboratory demonstrates good analytical practices and that such practices are documented in order to achieve the specified detection limits.

The accuracy of the method will be determined by spiking the sample matrix with analytes and surrogates. Standards and reference materials will also be analyzed to determine analyte concentrations for comparison with expected concentrations to provide a measure of accuracy of the methods. Percent recoveries of the spikes will be calculated and compared with control limits. A measure of precision will be obtained through the RPD between MS/MSD and laboratory duplicates. Sampling precision will be evaluated based on the RPD of duplicate field samples and compared to established control limits.

The generated data will be input into the laboratory's database management system. Records described in Sections 5 and 6 will be incorporated into the final file for the samples. Complete descriptions of analytical procedures to be used in the laboratory are described in the methods and in the laboratory's QA Manual.

7.2. Method detection limit

The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. For inorganics, the instrument detection limit (IDL) is determined by multiplying the Students t-Test value the standard deviation obtained for the analysis of a standard solution at a concentration of three to five times the estimated IDL on three days with a minimum of seven measurements. The PQL is the lowest concentration that can be reliably quantified within specified limits of precision and accuracy during routine laboratory operations. Tables 7-1, 7-2, and 7-3 list typical laboratory PQLs or reporting limits.

For radionuclides the Minimal Detectable Concentration (MDC) is typically calculated at the 95 percent confidence level.

Table 7-1 *Laboratory PQLs for VOCs (SW8260).*

Parameter	*Soil PQL (ug/kg), wet wt.*
Chloromethane	5
Vinyl Chloride	5
Bromomethane	5
Chloroethane	5
Acetone	10
1,1-Dichloroethene	2.5
Methylene chloride	2.5
Carbon disulfide	2.5
trans-1,2-Dichloroethene	2.5
1,1-Dichloroethane	2.5
2-Butanone	10
cix-1,2-Dichloroethene	2.5
Chloroform	2.5
1,1,1-Trichloroethane	2.5
Carbon tetrachloride	2.5
1,2-Dichloroethane	2.5
Benzene	2.5
Trichloroethene	2.5
1,2-Dichloropropane	2.5
Bromodichloromethane	2.5
4-Methyl-2_pentanone	5
cis-1,3-Dichloropropene	2.5
Toluene	2.5
trans-1,3-Dichloropropene	2.5
1,1,2-Trichloroethane	2.5
Dibromochloromethane	2.5
2-Hexanone	5
Tetrachloroethene	2.5
Chlorobenzene	2.5
Ethylbenzene	2.5
Xylene (total)	2.5
Styrene	2.5
Bromoform	2.5
1,1,2,2-Tetrachloroethane	2.5

Notes: PQL indicates practical quantitation limit.

Table 7-2 *Laboratory PQLs for TCL metals (SW6010).*

Parameter	Soil PQL (ug/kg), wet wt.
Aluminum	10
Antimony	6
Arsenic	0.5
Barium	10
Beryllium	1
Cadmium	1
Calcium	100
Chromium	1
Cobalt	5
Copper	1
Iron	5
Lead	0.5
Magnesium	100
Manganese	5
Nickel	5
Potassium	500
Selenium	0.5
Silver	1
Sodium	100
Thallium	1
Vanadium	5
Zinc	1

Notes: PQL indicates practical quantitation limit.

Table 7-3 *Laboratory reporting for radionuclides (modified USEPA Method 907.0 and Method*

Parameter	Rlsoil (picocuries/g)
Thorium 228, 230, 232	0.4
Uranium 234, 235, 238	0.4
Gamma spectroscopy	0.1*

Note: RL Indicates reporting limit
* = relative to Cesium 137

Table 7-4 *Laboratory PQLs for PCBs (SW8082)*

Parameter	Rlsoil (picocuries/g)
Aroclor 1016	0.017
Aroclor 1221	0.017
Aroclor 1232	0.017
Aroclor 1242	0.017
Aroclor 1248	0.017
Aroclor 1254	0.017
Aroclor 1260	0.017

Notes: PQL indicates practical quantitation limit.

8. Data reduction, evaluation, and reporting

For data to be scientifically valid, legally defensible, and comparable, valid procedures must be used to prepare this data. Laboratory analytical Level III (USEPA 1987) documentation will be required for each sample analysis. The following describes the data reduction, usability and reporting procedures to be used for the Analytical Level III laboratory data.

8.1. Data production, handling, and reporting

Specific laboratory procedures and instrumentation can be found in the QA Manual and/or standard operating procedures (SOPs) from the laboratory. The data production and reporting procedures described below will be employed at the laboratory.

8.1.1. Data reduction

Data reduction consists of manual and computer data reduction procedures and calculations. Computer data reduction procedures and calculations will be checked manually by the laboratory to verify that compound identification and quantitation adhere to method requirements. The laboratory will be responsible for maintaining a listing of computer-based data reduction programs and SOPs for data reduction. Sample preparation or extraction logs will be used to document sample preparation information (i.e. preparation weights, volumes, and reagents). Instrument injection logs or bench sheets will also be maintained for each instrument.

Experienced analysts in accordance with analytical method requirements will perform qualitative identification and quantitation of organic analytes.

8.1.2. Laboratory data review

Analytical results are generally entered into the laboratory computer system by the analyst, independently reviewed by another analyst or supervisor experienced in the method, and approved by the Laboratory Manager. The following are requirements that are generally examined as part of this review:

- Initial and continuing calibrations met the acceptance criteria defined in the method standard procedure. Standards in the calibration curve covered the expected concentration ranges of the samples including the PQL or RL.

- Sample results fell within the range of the standard curve.

- For GC/MS methods requiring internal standards, retention times and area responses were evaluated against limits established by the daily calibration.

- Method blanks were processed with each analytical batch and no detectable levels of contamination were identified.

- MS/MSD were performed at the required frequency and recoveries were within acceptable control limits.

- Duplicate analyses were performed at the required frequency and results were within the control limits.

- LCS analyses were performed with each analytical batch and the results obtained were within control limits.

- Compounds identified by GC/MS have been manually rechecked by comparison with the data system library for both target compounds and tentatively identified compounds. Retention times and ratios of fragmentation were verified.

- Calculations have been accurately performed.

- Reporting units are correct.

- Data for the analysis provide a complete audit trail.

- Reported detection limits comply with data quality indicator requirements.

The analyst's supervisor will check a minimum of 10 percent of the data back to raw data in the secondary review. When required analyses on the samples in a project are complete, entered, and reviewed, a report will be generated. The report will be forwarded to the assigned Laboratory Project Supervisor or designee for review. The report will then be reviewed for the following items (at a minimum):

- QC data will be reviewed to identify whether or not internal specification and contract requirements have been met.

- Non-conformance reports, if any, will be reviewed for completion of corrective actions and their impact of results. Non-compliance and corrective action procedures will be documented in the case narrative in the final report.

The report requires the signature of the Laboratory Project Supervisor or designee. Electronic data are copied onto computer tape, inventoried, and stored off-Site in a secure facility, or within locked cabinets on Site. This data archive system is maintained minimally for 10 years.

Analytical data packages, which are can be fully validated, and document sample preparation, extraction, and analysis, will be provided for the analyses. Data report forms will be securely bound and the pages will be sequentially numbered. The analytical reports for sample matrices will conform to the data deliverable requirements as listed in NYSDEC ASP 10/95 revision, Category B (NYSDEC 1995). The laboratory will provide both hardcopy and electronic versions of the analytical data.

8.2. Data usability

A Data Usability Summary Report (DUSR) will be performed to determine whether or not the data meets Site specific criteria for data quality and use. Excursions from QA/QC criteria will be qualified based on guidance provided in USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-94/012 (USEPA 1994a) and for USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review EPA 540/R-94/013 (USEPA 1994b) or most recent USEPA data validation guidelines.

<u>Preparation of a DUSR:</u>

The DUSR is developed by reviewing and evaluating the analytical data package. During the course of this review the following questions must be answered:

1. Is the data package complete as defined under the requirements for the NYSDEC ASP Category B or USEPA CLP deliverables?

2. Have all holding times been met?

3. Do all the QC data: blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?

4. Have all of the data been generated using established and agreed upon analytical protocols?

5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?

6. Have the correct data qualifiers been used?

Data qualifiers may include the following:

U Indicates that the compound was analyzed for, but was not detected. The sample quantitation limit is presented and adjusted for dilution and percent moisture. This qualifier is also used to signify that the detection limit of an analyte was raised as a result of analytes detected in laboratory and/or field blank samples.

J Indicates that the detected sample result should be considered approximate based on excursions from QA/QC criteria. Additionally, for organic analyses this qualifier is used either when estimating a concentration for tentatively identified compounds or when the mass spectra data indicate the presence of a compound that meets identification criteria but, the sample result is less than the compound quantitation limit.

UJ Indicates that the detection limit for the analyte in this sample should be considered approximate based on excursions from QA/QC criteria.

R Indicates that the previously reported detection limit or sample result has been rejected due to a major excursion from QA/QC criteria, for example percent recoveries of less than ten percent. The data should not be used for qualitative or quantitative purposes.

Evaluation of NYSDEC ASP Matrix Spike Blank data - If the Matrix Spike Blank recovery is less than the ASP criteria, the positive results should be qualified as J, estimated biased low. If the MSB recovery is less than the ASP criteria, but greater than 10 percent, the non-detects should be qualified J, biased low. If the Matrix Spike Blank recovery is less than 10 percent, the non-detect data must be rejected.

Any QC exceedances must be numerically specified in the DUSR and the corresponding QC summary sheet from the data package should be attached to the DUSR. All data that would be rejected by the EPA Region 2 Data Validation Guidelines must also be rejected in the DUSR.

Once the data package has been reviewed and the above questions asked and answered the DUSR proceeds to describe the samples and the analytical parameters. Data deficiencies, analytical protocol deviations and quality control problems are identified and their effect on the data is discussed. The DUSR shall also include recommendations on resampling/reanalysis. All data qualifications must be documented following the NYSDEC ASP 95 Rev. guidelines or the EPA Region 2 data validation guidelines.

9. Internal quality control checks

9.1. Laboratory QA/QC checks

The overall effectiveness of a quality control program depends upon operating in the field and laboratory according to a program that systematically ensures the precision and accuracy of analyses by detecting errors and preventing their recurrence or measuring the degree of error inherent in the methods applied.

Tables 9-1 through 9-4 summarize the laboratory corrective actions by analytical method. Requirements as listed in NYSDEC ASP revision 10/95 Exhibit E will be adhered to (NYSDEC 1995b). A brief description of laboratory QA/QC analyses is contained in the following subsections.

9.1.1. GC/MS tuning

Tuning and performance criteria are established to verify mass resolution, identification, and to some degree, instrument sensitivity. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria should be met in all circumstances.

9.1.2. Calibration

Compliance requirements for satisfactory instrument calibration are established to verify that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of analysis, and continuing calibration and performance checks document satisfactory maintenance and adjustment of the instrument on a day-to-day basis.

9.1.3. Blanks

The laboratory will analyze several types of blanks. Corrective action procedures will be implemented for blank analyses if target compounds are detected at concentrations greater than the PQL (or five times the PQL for acetone, 2-butanone, methylene chloride, toluene, and phthalate compounds). The criteria for evaluation of blanks apply to any blank associated with a group of samples. If problems with a blank exist, data associated with the project must be carefully evaluated to determine whether or not there is an inherent variability in the data for the project, or if the problem is an isolated occurrence not affecting other data.

A reagent blank consists of laboratory distilled water and any reagents added to a sample during analysis only, or straight solvent. A reagent blank is usually analyzed following highly contaminated samples to assess the potential for cross-contamination during analysis. A method blank is a water or soil blank that undergoes the preparation procedures applied to a sample (i.e. extraction, digestion, clean up). These samples are analyzed to examine whether sample preparation, clean up, and analysis technique result in sample contamination. The laboratory will prepare and analyze a method blank with each group of 20 samples of similar matrix that are extracted, digested, or analyzed at the same time (within same 12 hour period for GC/MS analysis).

Equipment and trip blanks will also be collected and submitted for laboratory analysis, where appropriate. Equipment and trip blanks will be handled in the same manner as environmental samples. Equipment and trip blanks are analyzed to assess contamination introduced during field sampling procedures and sample shipment, respectively.

9.1.4. Internal standards performance

Internal standards, which are compounds not found in environmental samples, will be spiked into blanks, samples, MS/MSDs, and laboratory control samples (LCS) at the time of analysis for VOC. Internal standards are used to quantitative results and correct for injection variability for VOC analyses. Internal standards must meet retention time and performance criteria specified in the analytical method or the sample will be reanalyzed.

9.1.5. Surrogate recovery

Accuracy and matrix biases for individual samples are monitored for organic analyses using surrogate additions. Surrogates are compounds similar in nature to the target analytes, which are spiked into environmental samples, blanks, and quality control samples prior to sample preparation for organic analyses. The evaluation of the results of these surrogate spikes is not necessarily straightforward. The sample itself may produce effects due to such factors as interference's and high concentrations of analytes. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the review and usability of data based on specific sample results is frequently subjective.

9.1.6. LCS analyses

LCSs are standard solutions that consist of known concentrations of the target analytes spiked into laboratory-distilled water or a clean sand. They are prepared or purchased from a certified manufacturer from a source independent from the calibration standards to provide an independent verification of the calibration procedure. They are spiked with target analytes listed in Tables 7-1, 7-2, and 7-3. These QC samples are then prepared and analyzed following the same procedures employed for environmental sample analysis to assess method accuracy independently of sample matrix effects. The laboratory will prepare and analyze a LCS with each group of 20 samples of similar matrix that are extracted, digested, or analyzed at the same time (within same 12 hour period for GC/MS analysis). Percent recoveries will be evaluated to assess the efficiency of preparation and analysis method independent of environmental sample matrix effects.

9.1.7. MS/MSD or laboratory duplicate samples

MS/MSD or laboratory duplicate analyses will be performed on environmental samples at a frequency of one per sample matrix and every 20 samples of a similar matrix. Whenever possible MS/MSD and laboratory duplicate samples will be prepared and analyzed within the same batch as the environmental samples. MS/MSD samples will be spiked at the laboratory with target analytes. MS/MSD and laboratory duplicate data are generated to determine long-term precision and accuracy of the analytical method with respect to sample matrices.

9.1.8. Compound identification and quantitation

The objective of the qualitative criteria is to minimize the number of erroneous identifications of compounds. An erroneous identification can either be a false positive (reporting a compound present when it is not) or a false negative (not reporting a compound that is present). The identification criteria can be applied much more easily in detecting false positives than false negatives. Negatives, or non-detected compounds, on the other hand represent an absence of data and are therefore, much more difficult to assess. The objective for quantitative requirements is to maximize the accuracy of data and sensitivity of the instrument. Samples should be analyzed undiluted to maximize sensitivity. Samples must be reanalyzed at the appropriate dilution when concentrations exceed the linear calibration range to maximize accuracy.

9.2. Control limits

In the event that method control limits are not provided, laboratory control limits will be established separately for each matrix type for spike and duplicate analyses. Laboratory control limits can be considered action limits. These limits are defined as "three standard deviations of the mean and correspond to 99.7 percent confidence limits of a normal distribution curve. The laboratory will establish control limits for each analyte of concern using a minimum of 20 data points. Laboratory control limits may change since limits are minimally updated on a yearly basis with the addition of new data points.

The laboratory control limits used to assess data for this program will be summarized by the laboratory in the analytical report.

9.3. Field sampling QA/QC

Field sampling crews will be under direct supervision of the Field Supervisor. Bound logbooks and appropriate data sheets will be used to document the collection of samples and data so that an individual sample or data set can be traced back to its point of origin, sampler, and type of sampling equipment. Sampling will be performed according to the methods provided in the Work Plan and in this QAPP. Blind field duplicate samples will be collected and sent to the laboratory for analysis in conjunction with the environmental samples. Field sampling precision will be evaluated through the RPD of the duplicate sample analyses results. Control limits for field duplicate precision have been established at "100 percent for soil samples. Decontamination of sampling equipment will be verified through the analysis of equipment blanks. Proper chain-of-custody protocols, as presented in Section 5 of this QAPP, will be followed.

10. Performance and system audits

10.1. Performance audits

At the discretion of the Project Manager, field and laboratory performance audits consisting of on-Site performance evaluations will be conducted once during the field and laboratory analysis program. O'Brien & Gere's QAO or his designee will perform the audits. These audits will evaluate the adherence to the QA program outlined in this QAPP. The protocols used to conduct the audits may be found in the following sections. Acceptance criteria used in determining the need for corrective action will be those criteria defined in this QAPP. Where acceptance criteria are not defined for laboratory procedures and analytical methods, the laboratory's standard operating procedure and QA Manual will be consulted. The results of the field and laboratory audits will be documented and submitted to the Project Manager. These reports and any corrective actions, which were implemented as a result of the audits, will be included in the technical report.

10.1.1. Laboratory audit protocol

The laboratory audit will note factors that may affect the quality of the analytical results. Minimum QA/QC criteria specified in this QAPP and the analytical methods must be adhered to. The areas of concern of the laboratory audit will include:

- Implementation of a scientifically sound QA/QC program addressing precision, accuracy, reproducibility, comparability, completeness, and blank contamination;
- Sufficient documentation and record keeping for technical personnel external to the laboratory to recreate each analytical event; and
- Compliance with the project requirements for laboratory analysis.

The specific parameters to be evaluated include:

- Data comparability;
- Calibration and quantitation;
- QC execution;

- Out-of-control events;
- Standard operating procedures;
- Sample management;
- Record keeping;
- Instrument calibration records;
- Other analytical records;
- QC records;
- Corrective action reports;
- Maintenance logs;
- Data review;
- Limits of detection;
- QC limits; and
- Analytical methods.

10.1.2. Field audit protocol

The purpose of a field audit is to identify whether the systems and procedures described in the Work Plan and QAPP are operational in the field and contributing to the production of accurate and defensible analytical results. The QA Officer or his designee may perform an on-Site evaluation. The areas of concern in a field audit include:

- Sampling procedures;
- Decontamination of sampling equipment, if applicable;
- Chain-of-custody procedures;
- Standard operating procedures; and
- Proper documentation in field notebooks.

10.2. System audits

Laboratory and field performance will be monitored through the analysis of equipment and laboratory blanks, spiked samples, laboratory control samples, laboratory and field duplicates, and performance evaluation samples. The laboratory QA Coordinator, in conjunction with the QA Officer and the Project Manager, will formulate corrective actions in the event that QC limits specified in this document are exceeded. The results of the system audits will be documented in the investigation report.

11. Preventative maintenance

Preventive maintenance procedures will be carried out on field equipment in accordance with the procedures outlined by the manufacturers' equipment manuals. Field equipment used during this project will have a specific maintenance instruction sheet accompanying it. Maintenance activities involving field equipment will be recorded in a field logbook.

Major analytical equipment at the laboratory is typically covered by some type of maintenance contract, usually with the instrument manufacturer. The degree and extent of contracted routine or preventive maintenance assistance is a function of the complexity of the equipment, amount of equipment redundancy and the laboratory in-house expertise relative to repair and maintenance of the particular piece of equipment. Maintenance activities are documented and maintained in permanent files and logbooks.

12. Data assessment procedures

The procedures employed by the laboratory to assess the quality of data generated in the laboratory include, but are not limited to, the following determinations:

- Analytical precision per method;
- Analytical accuracy per method;
- Analytical completeness; and
- MDLs, IDLs, and PQLs.

Data quality reviews by analysts, supervisors, managers, laboratory directors, and QA personnel contribute to the total process.

Precision and accuracy will be assessed using control charts. Control charts will consist of line graphs that provide a continuous graphic representation of the state of each analytical procedure. The standard deviation of the mean of the QC measurement is calculated. The upper and lower warning limits are set at plus or minus two standard deviation units. However, the upper and lower control limits are set at plus or minus three standard deviation units. Acceptable data are realized when results fall between the lower and upper warning limits. If the QC value falls between the control limit and the warning limit, the analysis should be scrutinized as possibly out of control.

In general, the accuracy of the methods will be evaluated by spiking the sample matrix with the analyte and by analyzing reference materials with known concentrations. The spiking levels will be selected to reflect the concentration range of interest. Percent recoveries of the spikes and reference materials will be calculated and compared to the established limits. The precision of the methods will be evaluated by the analysis of matrix spike and laboratory and field duplicate samples. The precision will be evaluated by calculating the RPD between the duplicates. RPD calculations will be compared to the established limits.

The definitions and equations used for the assessment of data quality are discussed below.

Accuracy - Is a measure of the nearness of an analytical result, or a set of results, to the true value. Normally, the term accuracy is used synonymously with percent recovery and is usually expressed in terms of error or bias. Percent recovery describes either the recovery of a synthetic standard of known value, or the recovery of known amount of analyte (spike) added to a sample of known value. The percent R or accuracy can be calculated by using:

standards: percent R = (observed value/true value) x 100

spikes: percent R = ((concentration spike + sample concentration) – sample concentration x 100) / concentration spike

Precision - Refers to the agreement or reproducibility of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is usually expressed in terms of the percent difference (percent D) or RPD. The percent D is calculated by using:

Percent D = (larger SR - smaller SR x 100)/smaller SR

Where: SR is the sample result.

The RPD is calculated by using:

RPD = (*OSR - DSR* x 100)/((OSR + DSR)/2)

Where: OSR is the original sample result and DSR is the duplicate sample result.

Average - The average or arithmetic mean (X) of a set of n values (Xi) is calculated by summing the individual values and dividing by n:

$$X = (\sum Xi_{I=1 \text{ to } n})/n$$

Range - The range (Ri) is the difference between the highest and lowest value in a group. For n sets of duplicate values (X2, X1) the range (Ri) of the duplicates and the average range (R) of the n sets are calculated by the following:

$$R_i = X_2 - X_1$$

$$R = \sum Ri_{i=1 \text{ to } n}/n$$

Standard Deviation and Variation - The standard deviation (S) of a sample of n results is the most widely used measure to describe the variability of a data set. It is calculated by using the following equation:

$$S = \sqrt{\frac{\sum (Xi - X)^2_{i-1 \text{ to } n}}{n}}$$

Where X is the average of the n results and Xi is the value of result i.

Normally, X "S will include 68% and X" 2S includes about 95% of normally distributed data.

The variance is equal to S^2. The percent relative standard deviation (percent RSD) or coefficient of variation (CV) is the standard deviation divided by the mean and multiplied by 100 as follows:

$$CV = 100S/X$$

The Laboratory QA Coordinator, with individual laboratory group leaders, will identify any data that should be rated as "unacceptable", based on the assessment of the QA/QC criteria. Data assessment will be evaluated and discussed in the data usability report(s).

13. Corrective action

Corrective action procedures will be implemented based on unacceptable audit results or upon detection of unacceptable data during evaluation. Two types of audits will be performed during this investigation. The data generation process will be audited by assessing adherence to method or laboratory control limits and by performing an on-Site laboratory audit, if requested by the Project Manager. The field program will be audited by assessing adherence to the procedures outlined in the Work Plan and in this document, by the analysis of field QC samples, and by performing an on-Site field audit, if requested by the Project Manager. If needed, corrective action procedures will be developed on a case-by-case basis. The enacted corrective actions will be documented in the appropriate notebook, log, or case filé. File and laboratory personnel are encouraged to discuss specific issues and proposed corrective actions with the QA Officer.

Generally, the following corrective actions may be taken by the laboratory. When calibration, instrument performance, and blank criteria are not met, the cause of the problem will be located and corrected. The analytical system will then be recalibrated. Sample analysis will not begin until calibration, instrument performance, and blank criteria are met. When matrix spike, reference standard, or duplicate analyses are out of control, samples analysis will cease and the problem will be investigated. Depending on the results of the overall QC program for the sample set, the data may be accepted, accepted with qualification, or determined unusable. If the laboratory determines data to be unusable, those samples will be prepared and reanalyzed. If matrix interferences are suspected, samples will be subjected to one or more of the clean-up techniques specified in the analytical methods. If QC criteria are met upon reanalysis, only the new results are reported. If QC criteria are still not met upon reanalysis, both sets of sample results will be reported.

The laboratory will make every reasonable effort to correct QC excursions and to document the presence of matrix interferences. In this way, unnecessary resampling of difficult matrices may be avoided. However, if matrix interferences are not documented resampling may be required.

Corrective actions for the field investigation program, if required, will generally involve altering the field procedure to match the guidelines set forth in the Work Plan and in this QAPP. If problems arise with procedures or guidelines set forth herein, the client, the QA Officer, and the Project Manager, in conjunction with the appropriate agencies, will formulate an appropriate corrective action.

14. QA reports to management

The deliverables associated with the investigation will contain separate QA sections where data quality information collected during the investigation is summarized. These reports will be prepared under the direction of the Project Manager and will include the QA Officer's report on the accuracy, precision, and completeness of the data and the results of the performance and system audits.

References

Environmental Measurements Laboratory (EML) Procedures Manual. 1990. 27th Edition, Volume 1, U.S. Department of Energy, New York, New York.

Los Alamos National Laboratory (LANL). 1995. Health and Environmental Chemistry: Analytical Techniques, Data Management, and Quality Assurance, LA-10300-M, Vol. II.

NYSDEC. 1991. RCRA Quality Assurance Project Plan Guidance.

NYSDEC. 1995. Division of Hazardous Waste Remediation Divisional Technical and Administrative Guidance Memorandum (TAGM).

_____. 1995b. NYSDEC Analytical Services Protocol (ASP) Methods, 1995 Revisions.

USEPA. 1980a. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80.

_____. 1980b. Prescribed Protocol for Measurement of Radionuclides in Drinking Water, EPA-600/4-80-032.

USEPA. 1987. Data Quality Objectives for Remedial Response Activities, EPA/540/6-87/003.

USEPA. 1994a. Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-94/012.

_____. 1994b. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review EPA 540/R-94/013.

USEPA. 1996. Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), 3rd Edition.

Table 4-1. *Field sampling summary table*

Parameter	Matrix	Sample containers and volumes	Preservation	Holding times (from verified time of sample receipt (VTSR))	Environmental samples*	QC Samples		
						Field duplicates (frequency)	Trip blanks	MS/MSDS (frequency)
VOCs	Soil boring	125 milliliter wide mouth glass container sealed with a septum	4°C	7 days (unpreserved)	TBD	5%	1 each per shipment	5 percent
Metals	Soil boring	4 ounce wide mouth glass container with Teflon® lined lid	4°C	180 days	TBD	5%	0	5 percent
PCBs	Soil boring	250 milliliter wide mouth container with Teflon® lined lid	4°C	5 days to extraction; 40 days from extraction to analysis	TBD	5%	0	5 percent
pH	Soil boring	50 milliliter wide mouth container with Teflon® lined lid	4°C	ASAP	TBD	5%	0	5 percent
Radionuclides, Gamma Spectroscopy	Soil boring	2-250 milliliter wide mouth containers with Teflon® lined lid	4°C	6 months	TBD	0%	0	0 percent

Note: MS/MSD indicates matrix spike/matrix spike duplicate sample
PCBs – polychlorinated biphenyls
VOCs - volatile organic compounds
Metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc
Radionuclides include thorium 228, 230, 232, uranium 234, 235, 238, and radium. MD for radionuclides will be performed according to the MD criterion presented in section 4.3.2.

* Note: The actual number of samples will be determined in the field in accordance with the Work Plan and Table 5.1 in the FSP.

Table 9-1
Volatile (GC/MS) Quality Control Requirements and Corrective Actions
SW-846 8260B with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Corrective Action
Holding times	Samples must be extracted and analyzed within holding time.	VOCs: Analyze within 10 days from verified time of sample receipt if preserved, 7 days if unpreserved.	If holding times are exceeded for initial or reanalysis required due to QC excursions, notify QAO immediately since resampling may be required.
MS Tuning	Once every 12 hours.	Bromofluorobenzene key ions and abundance criteria listed in the method must be met for all nine ions.	1. Tune the mass spectrometer. 2. Document corrective action - samples cannot be analyzed until control limit criteria have been met.
Initial Calibration	Prior to sample analysis and when continuing calibration criteria are not met.	1. Five concentrations bracketing expected concentration range for all compounds of interest. 2. Criteria as listed in NYSDEC ASP 10/95 Exhibit E.	1. Identify and correct problem. 2. If criteria are still not met, recalibrate. 3 Document corrective action - samples cannot be analyzed until calibration control limit criteria are met.
Continuing Calibration	Every 12 hours, following bromofluorobenzene.	Criteria as listed in NYSDEC ASP 10/95 Exhibit E.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Document corrective action - samples cannot be analyzed until calibration control limit criteria are met.
Preparation Blank Analysis	Every 12 hours, following continuing calibration	Common laboratory contaminants less than 5x PQL; anything else less than PQL.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument, recalibrate analytical system, and reanalyze all samples with the same compounds as detected in the blank. 3. Document corrective action - samples cannot be analyzed until blank criteria have been met.

Table 9-1
Volatile (GC/MS) Quality Control Requirements and Corrective Actions
SW-846 8260B with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Corrective Action
Field / Equipment Blank Analysis	Every 20 samples.	Common laboratory contaminants less than 5x PQL; anything else less than PQL.	1. Investigate problem, contact QAO. 2. Write an explanation.
Trip Blank	One per cooler containing VOC samples.	Common laboratory contaminants less than 5x PQL; anything else less than PQL.	1. Investigate problem, contact QAO. 2. Write an explanation.
Laboratory Control Sample Analysis	Each analytical batch (every 12 hours). Prepared independently from calibration standards.	Recovery within matrix spike blank limits (NYSDEC ASP Exhibit E) if available, otherwise within laboratory control limits. Spike must contain all target analytes.	1. If recovery failures are above control limits and these compounds are not detected in the associated samples, contact QAO. 2. Reanalyze LCS and examine results of other QC analyses. 3. If recovery is still outside limits and other QC criteria are met, contact QAO. 4. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 5. Document corrective action.
Internal Standards	All samples and blanks (including MS/MSD)	1. Response -50% ±100% of internal standards from continuing calibration of the day. 2. Response time must be ± 30 seconds from associated standard.	1. Reanalyze. 2. If still outside of the limits, qualify data. 3. Document corrective action.
Surrogate Spike	All samples and blanks (including MS/MSD)	Recovery within NYSDEC ASP 10/95 Exhibit E control limits.	1. Reanalyze any environmental or QC sample with surrogates that exceed control limits. 2. Qualify the data. 3. Document corrective action.

Table 9-1
Volatile (GC/MS) Quality Control Requirements and Corrective Actions
SW-846 8260B with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Corrective Action
MS/MSD Analysis	One per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater.	Recovery and RPD within NYSDEC ASP 10/95 Exhibit E limits, if available, otherwise within laboratory limits.	1. Reanalyze if <10%. 2. If >10% and LCS criteria are met, document in case narrative; no additional corrective action required. 3. If >10% and LCS criteria are exceeded, examine other QC data for source of problem; *i.e.* surrogate recoveries for extraction efficiency and calibration data for instrument performance issues. 4. Take corrective action as required, re-extract or reanalyze samples and associated MS/MSD and LCSs as required.
Field Dup. Analysis	One per matrix and analytical batch and every 20 samples of similar matrix	100% RPD for soil.	If these criteria are not met, sample results will be evaluated on a case by case basis.

Table 9-2
Radionuclides Quality Control Requirements and Corrective Actions
Modified Method EML Th-0l-and EMLU-02
with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Laboratory Corrective Action
Holding Times	Samples must be extracted and analyzed within holding time.	Extract and analyzed within 6 months of verified time of sample receipt for soil samples.	If holding times are exceeded for initial or any reanalysis required due to QC excursions, notify the QAO immediately since resampling may be required.
Initial Calibration	For thorium and uranium: Efficiency - annually Efficiency check - monthly or prior to use Energy - quarterly or prior to use Energy check, resolution, background - weekly or prior to use	All calibrations should be evaluated statistically against determinations performed previously. If results are outside of statistical range, an explanation of the change in performance shall be provided.	If calibration results are measured outside of statistical ranges, the QAO will be notified. Explanations will be provided in the case narrative and in the instrument maintenance logbook.
Method Blank Analysis	1 per 20 samples of similar matrix extracted at the same time or 1 per batch.	Results must be less than or equal to MDC or less than 5X below lowest activity of the sample.	1. Reanalyze the batch. 2. If holding times have elapsed, contact the QAO immediately since resampling will be required.
LCS Analysis	1 per 20 samples of similar matrix extracted at the same times or 1 per batch for both alpha and beta emitter.	40 - 160% recovery.	1. Reanalyze the batch 2. If holding times have elapsed, contact the QAO immediately since resampling will be required.
Matrix Spike Analysis	For thorium and uranium: 1 per matrix type or per batch and every 20 samples of similar matrix.	75 - 125% recovery.	1. If LCS criteria are met, document in case narrative; no additional corrective action required.
Matrix Duplicate Analysis	1 per matrix type or per batch and every 20 samples of similar matrix.	RER ≤ 3.	1. If LCS criteria are met, document in case narrative; no additional corrective action required.

Table 9-2
Radionuclides Quality Control Requirements and Corrective Actions
Modified Method EML Th-01-and EMLU-02
with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Laboratory Corrective Action
Equipment Blank Analysis	One per sampling equipment and after every 20 samples, where applicable.	Result ≤ control requirements detection limits	1. Investigate problem; examine for potential cross contamination at lab or at field 2. Notify the QAO immediately since resampling may be necessary.
Field Duplicate Analysis	One per matrix type and every 20 samples of similar matrix.	RER ≤ 3.	No corrective action required since the laboratory will not know the identity of the field duplicate samples. Sample results will be evaluated on a case by case basis during the data evaluation process.
Tracer Recoveries	For thorium and uranium: Samples and QC samples	For thorium and uranium: 45 - 105% recovery.	1. If recovery is outside control limit, repeat analysis. 2. If reanalysis is outside control limit, notify QAO and document a matrix specific QC problem in the case narrative.
Note: For initial calibration, select the least stringent criteria; for example, weekly or prior to use is defined as must be performed prior to use of action has not been performed within a week prior to use.			

Table 9-3
Radionuclides Quality Control Requirements and Corrective Actions
Gamma Spectrometry

Audit	Frequency	Control Limits	Laboratory Corrective Action
Holding Times	Samples should be counted within holding time.	Though there are not regulatory holding times for radiochemistry parameters, samples should be counted within 6 months of the collection date.	If holding time is exceeded for initial or any re-analyses, contact the QAO immediately in order to discuss the possible need for re-sampling.
Efficiency Calibration Efficiency Calibration Check Energy Calibration Energy Calibration Check Resolution Check Background Background Check	annually weekly or prior to use monthly or prior to use weekly or prior to use weekly or prior to use monthly or prior to use weekly or prior to use	All calibrations should be evaluated against previously determined calibrations to verify consistency of response factors. Calibration checks should be statistically evaluated against initial calibrations to determine consistency and stability of systems.	If calibrations are inconsistent with those determined previously, no samples shall be counted until the variations are explained. If calibration checks are inconsistent, they should be repeated. If upon repeating they are still inconsistent, primary calibrations should be repeated. No samples should be counted until calibration anomalies are resolved.
Method Blank Analysis	1 per 20 samples	Results must be less than reporting limits or less than 5x below lowest sample activity for each isotope detected.	1. Reanalyze batch 2. If holding times have elapsed, contact QAO for instructions
LCS Analysis	1 per 20 samples	40 – 160% recovery	1. Reanalyze batch 2. If holding times have elapsed, contact QAO for instructions
Matrix Duplicate Analysis	1 per 20 samples	RER <2.0	1. If LCS criteria are met, document in case narrative; no additional corrective action is required.
Equipment Blank Analysis	One per sampling equipment and after every 20 samples where applicable	Results must be less than reporting limits or less than 5x below lowest sample	1. Investigate problem; examine potential for contamination in the field or lab 2. Notify QAO

Table 9-3
Radionuclides Quality Control Requirements and Corrective Actions
Gamma Spectrometry

Audit	Frequency	Control Limits	Laboratory Corrective Action
Field Duplicate Analysis	One per matrix type and every 20 samples of similar matrix	RER <3.0	No corrective action required since the identity of field duplicates will be blind to the lab.

Table 9-4
PCBs Quality Control Requirements and Corrective Actions
SW-846 Method 8082 with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Laboratory Corrective Action
Holding Times	Samples must be extracted and analyzed within holding time.	Extract within 5 days from verified time of sample receipt. Analyze extracts within 40 days from extraction.	If holding times are exceeded due to QC excursions, notify the QAO immediately since resampling may be required.
Initial Calibration	Prior to start up and when criteria are exceeded for continuing calibration.	1. As listed in NYSDEC ASP criteria.	1. Identify and correct problem. 2. Recalibrate instrument; samples must not be analyzed until initial calibration criteria are met.
Calibration Verification	Analyze calibration standards every 12 hours. Calibration verification standards should be analyzed every 20 samples.	1. As listed in NYSDEC ASP criteria.	1. Reanalyze 2. If criteria are still not met, identify and correct problem, recalibrate; reanalyze samples back to last compliant calibration standard. Samples must be bracketed by compliant calibration standards.
Retention Time Windows	Retention time windows must be established in accordance with NYSDEC ASP criteria.	1. Compounds must be within NYSDEC ASP criteria. 2. Retention time shift for surrogate in samples and standards must not exceed 0.3%.	1. Reanalyze non-compliant standards and samples. 2. If criteria are still not met, identify and correct problem, recalibrate; reanalyze samples back to last compliant calibration standard.
Method Blank Analysis	With each extraction batch, no more than 20 analytical samples, or each 7 calendar day period that samples are received, whichever is more frequent.	1. Compound concentrations must be less than reporting limits 2. Surrogate retention times must be within retention time windows.	1. Source of contamination must be investigated and corrected. 2. Clean instrument, recalibrate, reextract and reanalyze all associated samples. 3. Document corrective action Samples cannot be analyzed until blank criteria have been met.
Analytical Sequence	In accordance with NYSDEC ASP criteria.	NYSDEC ASP criteria.	1. Reanalyze with correct sequence. 2. Document corrective action.

Table 9-4
PCBs Quality Control Requirements and Corrective Actions
SW-846 Method 8082 with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Laboratory Corrective Action
LCS Analysis	One per 20 samples of similar matrix extracted at the same time. LCSs must be spiked with aroclors suspected to be present at the site at concentration specified in the method.	Percent recoveries must be within laboratory control limits.	1. Only if recovery failures are above control limits and these compounds are not detected in the associated samples, corrective action not required; document in case narrative. 2. Reanalyze LCS and examine results of other QC analyses. 3. If recovery is still outside limits, and other QC criteria are met, contact QAO. 4. If other QC criteria have not been met, stop, locate and correct problem, recalibrate instrument and reanalyze samples since satisfactory LCS. 5. Document corrective action.
MS/MSD Analysis	One per matrix type and every 20 samples of similar matrix. MS/MSDs must be spiked with aroclors suspected to be present at the site at concentrations specified in the method.	Recovery and RPD within NYSDEC ASP criteria.	1. Reanalyze if <10%. 2. If LCS criteria are also exceeded, examine other QC data for source of problem; *i.e.* surrogate recoveries for extraction, and efficiency and calibration data for instrument performance issues. 3. Take corrective action if other QC data criteria are exceeded (re-extract or reanalyze samples and associated MS/MSD and LCSs as required).
Matrix Spike Blank (MSB)	One per MS/MSD.	Recovery within NYSDEC ASP criteria.	1. Reprepare and analyze MSB/MS/ MSD. 2. If recovery is still outside limits, and other QC criteria are met, contact QAO. 3. If other QC criteria have not been met, stop, locate and correct problem, recalibrate instrument and reanalyze samples since satisfactory MSB. 4. Document corrective action.

Table 9-4
PCBs Quality Control Requirements and Corrective Actions
SW-846 Method 8082 with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Laboratory Corrective Action
Sulfur Blank	If only part of a set of samples required sulfur removal.	Compound concentrations must be less than or equal to reporting limits.	Reextract and reanalyze blank and associated samples.
Instrument Blank	The first analysis in the 12 hour analytical sequence.	Compound concentration must be less than or equal to one half of the reporting limits. Surrogates must be within retention time windows.	1. Stop analysis and correct. 2. Reanalyze. 3. All samples must be associated with acceptable instrument blank.
Surrogate Spike	Samples, blanks, MS/MSD, and LCSs must be spiked with method specified surrogate compounds.	1. Recovery within NYSDEC ASP criteria. 2. Corrective action is not required if one of the two required surrogates has recovery outside of control limits if the recovery is >10%.	1. Reanalyze. 2. If recovery is still outside control limits but >10%, document in case narrative report. 3. If recovery is <10% with reanalysis, re-extract and reanalyze the sample if the holding time has not elapsed. If holding time has elapsed, notify the QAO immediately prior to proceeding since resampling may be required.
Identification	Samples, blanks, and QC data.	1. Retention times must be within established retention time windows or must meet relative retention time criteria.	1. Investigate problem; reanalyze calibration standards to check for retention time shift.

Table 9-4
PCBs Quality Control Requirements and Corrective Actions
SW-846 Method 8082 with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Laboratory Corrective Action
Quantitation	Samples, blanks, and QC data.	1. Internal or external standard method. 2. Verify concentration is within linear calibration range. 3. Peak areas (three to five PCB peaks) unique to the target aroclor will be used to quantitate the aroclor concentration. 4. Every effort must be made to meet specified reporting limit requirements. 5. Soil samples concentrations must be corrected to dry weight.	1. If concentration is above linear calibration range, dilute sample and reanalyze. Dilution should result in concentration in the upper calibration range of the instrument. 2. Perform appropriate cleanup procedures as necessary to minimize sample matrix effects.
Field Duplicate Analysis	1 per matrix type and every 20 samples of similar matrix.	50% RPD for waters and 100% RPD for soil.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case by case basis during the data evaluation process.
Dilutions	1. When target analyte concentration exceeds upper limit of Calibration Curve. 2. Prior to diluting, samples will be cleaned up during sample preparation/extraction procedure using appropriate methods when matrix interference is present. 3. Do not dilute for MS/MSD samples.	Not applicable	Not applicable

Table 9-4
PCBs Quality Control Requirements and Corrective Actions
SW-846 Method 8082 with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Laboratory Corrective Action
Confirmation Analysis	Quantitation confirmation will be performed at a 10% per matrix; qualitative confirmation will be performed if matrix interference is or overlapping Aroclors are present.	Not Applicable	Not Applicable

Table 9-5
Metal Quality Control Requirements and Corrective Actions
SW-846 6010B with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Corrective Action
Holding Times	Samples must be digested and analyzed within holding time.	Metals – Analyze 180 days from verified time of sample receipt	If holding times are exceeded for initial or any reanalysis required due to QC excursions, notify the QAO immediately since resampling may be required.
Calibration Verification (ICV, CCV)	Calibrate daily according to method and each time instrument is set up; verify at more frequent of 10% or every 2 hours. Also verify at the end of each run. Standard at 1-2 times the PQL should be analyzed after initial cal for ICP.	90% to 110% of expected value for ICP and AA. NYSDEC ASP Exhibit E requirements.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Document corrective action - samples cannot be analyzed until calibration control limit criteria have been met.
Calibration Blank	At beginning and end of run and at a rate of 10% during run.	NYSDEC ASP Exhibit E requirements.	1. Identify and correct problem. 2. If criteria are still not met, recalibrate. 3. Document corrective action - samples cannot be analyzed until blank control limit criteria have been met.
Preparation Blank Analysis	1 per batch of samples digested, or 1 in 20, whichever is greater.	NYSDEC ASP Exhibit E requirements.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument and recalibrate analytical system and prepare and reanalyze affected samples if detected. 3. Document corrective action - samples cannot be analyzed until blank criteria are met.
Field / Equipment Blank Analysis	Every 20 samples, where applicable	NYSDEC ASP Exhibit E requirements.	1. Investigate problem, contact QAO. 2. Write an explanation.

Table 9-5
Metal Quality Control Requirements and Corrective Actions
SW-846 6010B with NYSDEC ASP Exhibit E Requirements

Audit	Frequency	Control Limits	Corrective Action
Laboratory Control Sample Analysis	Every 20 samples or each digestion batch. Prepared independently from calibration standards.	Recovery within NYSDEC ASP Exhibit E limits if available, otherwise within laboratory control limits.	1. Reanalyze LCS and examine results of other QC analyses. 2. If recovery is still outside limits, and other QC criteria are met, contact QAO. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 4. Document corrective action.
Serial Dilution Analysis	Only required when analyte concentration is >50 times the IDL after dilution for metals.	NYSDEC ASP Exhibit E requirements.	1. Qualify data. 2. Document corrective action.
Interference Check Sample Analysis	Beginning and end of each analytical run or twice during every 8 hours, whichever is more frequent for metals.	NYSDEC ASP Exhibit E requirements.	1. Reanalyze. 2. If limits are still exceeded, adjust instrument. 3. Restart analytical run and reanalyze samples analyzed since last satisfactory ICS. 4. Document corrective action.
Matrix Spike Analysis	1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater.	Recovery within NYSDEC ASP Exhibit E limits if available, otherwise within laboratory control limits.	1. Analyze post spike. 2. Document corrective action.
Laboratory Duplicate Analysis	1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater.	NYSDEC ASP Exhibit E requirements	1. Investigate problem and reanalyze. 2. Document corrective action.
Field Dup. Analysis	1 per matrix and analytical batch and every 20 samples of similar matrix	100% RPD for soil.	If these criteria are not met, sample results will be evaluated on a case by case basis.

APPENDIX D

Key Project Individuals Resumes

O'BRIEN & GERE

Pam M. Cox
Project Scientist

PROJECT ASSIGNMENT

PROFESSIONAL PROFILE

Ms. Cox has 7 years of experience in designing, implementing, and managing hydrogeologic investigations.

YEARS OF EXPERIENCE

With O'Brien & Gere: 1
With Other Firms: 6

EDUCATION

MS/1999/Hydrogeology - Water Resource Management - Syracuse University & SUNY ESF, Syracuse, NY

BS/1993/Environmental Law, Policy and Management; SUNY ESF, Syracuse, NY

TECHNICAL EXPERTISE

Ms. Cox has seven years of experience in the environmental field conducting hydrogeologic investigations, remedial investigations, site assessments, asbestos surveys, geotechnical investigations, and extensive field sampling programs. Field work included collecting soil samples, installing and developing monitoring wells, and sampling ground water. Data interpretation included water budget analyses, ground water flow maps, discharge maps, and vapor transport modeling. The modeling simulates contaminant vapor migration from the ground water to the indoor air by both diffusion and convection using site-specific parameters.

REPRESENTATIVE PROJECTS

HAZARDOUS WASTE MANAGEMENT

Ms. Cox's hazardous waste experience includes site investigations and remedial program design and implementation. Specifically, she has been involved in:

- hydrogeologic studies
- soil sampling
- monitoring well installations
- slug testing
- geophysical surveys
- ground water sampling
- sediment sampling programs
- biological studies
- aerial photograph interpretations
- report preparation
- interim remedial measure implementation

Ms. Cox has been the Project Manager and hydrogeologist for several multi-sources, multi-contaminant ground water investigations. Responsibilities included acting as client liaison, writing reports, reviewing previous site work, training junior personal, preparing project budgets, developing New York State Department of Environmental Conservation (NYSDEC) - approved work plans, mapping plumes, obtaining site closure and managing the appropriate release of sensitive public information.

Ms. Cox managed and performed field work including evaluating sites by magnetometer, ground penetrating radar, soil gas surveys, soil boring installation, pump tests, down-hole geophysical studies, packer testing, tank excavations, installation of nested piezometers and extensive biological sampling and other tasks related to ecological and human health risk assessment.

Ms. Cox has performed numerous regulatory compliance audits and Hazardous Materials Surveys for mercury, lead, polychlorinated biphenyls (PCBs) and chloroflourocarbons (CFCs) of industrial facilities. Additionally, she has conducted geotechnical investigations throughout New York.

Former farm site – The 100-acre site was impacted by PCBs, Metals (Ni, Cd, and Pb) and solvents emanating from a nearby former ammunitions manufacturing property. Project responsibilities included extensive multi-media and biological sampling, electro-shocking, working closely with the NYSDEC and subcontractors, and soil sampling, excavation and disposal.

Plastics molding company, Syracuse, NY – Delineated nature and extent of accidental PCB release. Impacted soils and stream sediments were excavated and removed.

Packaging company – Conducted a geotechnical investigation of the site, that included test borings, collection of disturbed and undisturbed soil samples, laboratory testing of the collected samples for consolidation testing and Atterberg limits. The results of the geotechnical investigation were used to evaluate engineering properties of the soil for foundation and slope stability calculations.

Steel manufacturer – Performed geotechnical test borings and applicable sampling to be used during estimating bearing capacities of foundations for building expansion and heavy industrial furnaces.

Project Manger for a petroleum manufacturer – Managed several sites involving oversight of the operation and maintenance of soil vapor extraction (SVE), air sparging and ground water pump-and-treat systems.

Confidential Client, NY – Performed electromagnetic geophysical survey of a site with buried drums. Primary responsibilities included developing and mapping the survey grid, data reduction, interpreting survey results, and making recommendations for further investigatory methods.

WATER RESOURCES:

Ms. Cox has supervised hydrogeology programs related to industrial and public water supply wells. These programs have involved:

- drilling supervision
- soils analysis
- aquifer testing
- well design
- well installation

Representative projects include:

Project Manager for a large aluminum-recycling facility's wetland wastewater coolant system investigation. Project responsibilities included extensive multi-media and biological sampling, electro-shocking, working closely with the NYSDEC, subcontractor coordination, soil classification, and monitoring well installation, development and sampling.

Industrial manufacturer, NY – Ground water flow mapping (bedrock, overburden, till, etc.), evaluating ground water flow direction and rate of flow.

Manufacturer of medical supplies – Oversaw down-hole geophysical methods, packer testing, and installation of nested piezometers, surface water and ground water sampling, and a soil vapor survey beneath the building at a site with freon contamination in the deep aquifer (greater than 300 ft below ground surface).

Municipal water supply, Liberty, NY – Project included well installation, ground water flow mapping, slug testing and source investigation and control. The pumping well drew in contamination from multiple sources.

ENVIRONMENTAL ASSESSMENT:

Ms. Cox has developed proposals, conducted site visits, composed reports and managed over 500 Phase I and II Environmental Site Assessments. As part of these assessments she characterized soil and ground water in relation to a variety of environmental considerations. In addition, she has been involved in reducing and analyzing analytical data, writing reports, interacting with clients, coordinating subcontractors, removing tanks, advancing test pits, responding to technical questions, classifying soils and installing, developing and sampling wells.

Representative projects include:

Natural Gas Facilities
Solar cell manufacturing plant
Food manufacturers
Printing Companies
Large wire manufacturer
Textile companies
Steel Mills
An electronic components manufacturer
Television/Entertainment Industry

INDUSTRIAL HYGIENE

Asbestos Surveys

Performed asbestos surveys for site assessments, demolition and renovation projects in industrial, commercial, and residential facilities. Coordinated project work schedules with the contractor(s) or owner(s) and maintained chain-of-custody documentation throughout sample analysis. Prepared reports for these surveys that included quantities, location and estimated abatement costs for identified materials.

Representative projects include:
Large Vacant Mall prior to demolition in Methuen, MA
Three high rise mixed residential and retail building in Boston, MA
Industrial Plant, Hudson Falls, NY
Lincoln Plant Facility, Rochester, NY

Health & Safety

Ms. Cox acted as the office Health and Safety officer. Her duties included scheduling and maintaining company training records, conducting health and safety meetings, preparing health and safety plans and developing a ground water sampling Statement of Procedures.

Site Health & Safety officer for several remedial projects. Tasks included writing and implementing the site health and safety plan, conducting daily health and safety briefings, writing up incident reports and formulating corrective actions for injuries that occurred on-site.

LABORATORY ANALYTICAL EXPERIENCE

Conducted chemical analyses of ground water, drinking water, soil and leachates for Phase II Investigations, SPDES and NPDES Permits and remediation projects.

PROFESSIONAL TRAINING

OSHA 40-Hour Safety Training
OSHA Supervisor Training
OSHA 8-Hour Refresher
Hazardous Materials Transportation Training: DOT/HM-126F
CPR and First Aid Certified
AHERA-Accredited Inspector
New York State Licensed Asbestos Inspector
Underground Storage Tank Closure Training
PCB Short Course: "PCBs What they are and How they are analyzed"
DNAPL Short Course: Practical Site Characterization & Remediation Techniques

PROFESSIONAL AFFILIATIONS

Association for Women Geoscientists – Northeastern Representative
Central New York Association of Professional Geologists
Environmental Breakfast Club of Central New York
Society of Military Engineers (SAME)

SELECTED PUBLICATIONS

An Evaluation of Methyl Tertiary Butyl Ether in the Ambient Air Above a Petroleum Spill: A Vapor Transport Analysis. 1999.

OBRIEN & GERE

Pam M. Cox
Project Scientist

O'BRIEN & GERE

Joseph R. Giovinazzo
Geologist

PROJECT ASSIGNMENT

TECHNICAL EXPERTISE

PROFESSIONAL PROFILE

REPRESENTATIVE PROJECTS

Prior to O'Brien & Gere Engineers

YEARS OF EXPERIENCE

With O'Brien & Gere: 1
With Other Firms: 13

EDUCATION

BS/1998/Geology; The University of North Carolina at Charlotte

PROFESSIONAL REGISTRATIONS

ENSR Engineering and Environmental, Irvine, CA – Project Geologist:

- Manage various phases of site remediation projects
- Conduct subsurface soil investigation. Experienced in hollow stem auger, air rotary, direct push and resonant sonic drilling techniques.
- CPT and slug testing data interpretation
- Prepare geologic cross sections, isoconcentration and groundwater gradient maps
- Experienced in the remediation of VOCs and hydrocarbons in water and soil
- Supervise and train technicians in water and vapor sample collection procedures

Vapor Extraction Technology, San Clemente, CA – Staff Geologist:

- Prepare technical reports to include site assessments, remediation, groundwater monitoring, underground storage tank removal and various site-specific reports.
- Install groundwater monitoring and vapor extraction wells
- Prepare business proposals, cost estimates, work and safety plans as well as scheduling of subcontractors and obtaining necessary permits
- Soil classification
- Conduct feasibility and radius of influence vapor extraction testing
- Computer skills include Microsoft Works, Corel, Word, and Excel.

Confidential Client, Polystyrene Manufacturing Facility, Santa Ana, CA – Managed and conducted site assessment activities including groundwater monitoring well installation, SPT borings to collect soil samples for geotechnical analysis, CPTs and direct push geoprobe borings.

Confidential Chemical Manufacturer, Carson, CA – Phase II Site Assessment. Conducted on and off-site hydrogeologic investigation. Installed borings using hollow stem auger and air rotary drilling methods, on-site well construction, groundwater sampling, and aquifer testing and report and risk assessment preparation.

Confidential Bulk Fuel Storage Facility, Phoenix, AZ – Phase II Site Assessment. Conducted groundwater sampling and vapor sampling.

Performed radius of influence testing and installed two vapor extraction systems to remediate MTBE plume.

Burbank Airport, Underground Storage Tank Removal, Site Characterization, and Remediation - Conducted field activities for contamination delineation, UST removal (7 USTs) and remediation by excavation of petroleum hydrocarbon contaminated soil and installation of one vapor extraction system.

Confidential Client, Aircraft Fastener Manufacturer, City of Industry, CA – Phase II Site Assessment. Installed numerous groundwater monitoring wells using hollow stem auger to collect soil and groundwater samples to delineate contamination.

Confidential Client, Manufacturer of commercial and military aircraft and spacecraft, Huntington, CA – Phase II Site Assessment. Conducted on and off-site hydrogeologic investigation to delineate VOC contamination in multiple aquifers. Installed soil borings, nested wells, and hydropunches.

Confidential Client, US Military, Sacramento, CA - Phase II Site Assessment (one active base and one inactive former rocket launch facility). Conducted groundwater sampling from existing wells, installed groundwater wells through multiple aquifers, advanced soil borings using air rotary methods and collected soil vapor and hydropunch samples.

Confidential Client, Oil Company, El Segundo, CA – UST removal, site characterization, and site remediation of service stations in Los Angeles, Lancaster, Banning, Huntington Beach, San Diego, and Dana Point, CA.

Joseph R. Giovinazzo
Geologist

Jason A. Hudson
Staff Scientist

PROJECT ASSIGNMENT

PROFESSIONAL PROFILE

Mr. Hudson has been responsible for performing a variety of industrial hygiene exposure assessment projects, as well as sample strategy design, job safety assessments, indoor air quality studies, asbestos project monitoring, and construction site safety supervision.

YEARS OF EXPERIENCE

With O'Brien & Gere: 1.5
With Other Firms: 0

EDUCATION

BS/1999/Industrial Hygiene; Clarkson University

PROFESSIONAL REGISTRATIONS

TECHNICAL EXPERTISE

- On-site construction safety
- Industrial hygiene and safety program
- Indoor air quality
- Asbestos project monitoring/air sampling
- Exposure monitoring
- Confined space
- Noise monitoring
- Ambient air monitoring

REPRESENTATIVE PROJECTS

CONSTRUCTION SITE SAFETY:

On-site construction safety

Merck Pharmaceuticals, PA- Construction Site Safety Officer for 10 employees. Responsible for personal protective equipment, trenching issues, load tagging, slope and grade inspection, issuing work permits, confined space entry, heavy machinery safety issues. Managed on-site paper work and daily logs, and held tool box and safety meetings with the construction crew.

Proctor & Gamble, MO - Construction Site Safety Officer for over 20 employees. Responsible for various safety issues including HAZCOM, personal protective equipment issues, load tagging, trench digging and sloping, grade inspection, various equipment issues, hot work permits, crane and other heavy machinery safety issues. Managed on-site safety paper work and accident reports.

Safety Programs

GE Aircraft Engines – Aided in the creation of Job Safety Analysis program for the GEAE sites across the nation. Created the workbooks used in the training of GEAE employees. Was placed on-site to observe work stations labeled as hazards, and broke the tasks down along with their hazards then placed this information in the database created by O'Brien & Gere so the GEAE employees would have a organized file of JSA's per work task.

Intertek Testing Services, Inc. – Created a laser safety program for Class I – Class IV lasers. Responsible for labeling hazards and ways to protect employees from exposure to hazards. Researched all applicable standards for necessary precautions and standard that need to be followed.

Also performed a laboratory assessment in their fire and flame laboratory. Aided in the revision of their lab safety programs. Researched and used all applicable standards and guidelines to complete the assessment. Identified areas where steps were necessary for a safe laboratory environment.

Exposure Monitoring

Anaren Microwave Inc.- Performed air sampling programs to evaluate worker exposure to chlorine and hydrochloric acid associated with computer circuit board etching processes. Also responsible for measuring air flow in hoods incorporated into the etching machine to evaluate the efficiency of fume/particulate capture. Conducted visual inspection of the work area.

Interface Solutions, Inc.- Performed air sampling programs to evaluate worker exposure to fiberglass and formaldehyde associated with pulp and paper production. Conducted visual inspection of the work area.

Madison County-Performed air sampling programs to evaluate worker exposure to silica and respirable dust associated with the Highway Department's road maintenance responsibilities. Also conducted sampling for various solvents used during a print press cleaning activity. Conducted visual inspections of the work areas.

Auburn Technologies, Inc.- Performed air sampling programs to evaluate worker exposure to silver fumes associated with soldering activities and 2-butoxy ethanol fumes associated with rust proofing activities. Conducted a visual inspection on workstations and evaluated efficiency of the ventilation system.

Carrier Corporation, NY – Performed air sampling programs in 1998, 1999, and 2000 to evaluate worker exposure to MWF oil mist, mineral oils, respirable and nuisance dusts, furfuryl alcohol, IPA, glycol ether, alkaline dust, stoddard solvent, ethanolamine, diethanolamine, triethanolamine, butyl cellosolve, volatile organic compounds, inorganic acids, metals, formaldehyde, and carbon monoxide associated with metal working operations throughout the manufacturing facility. Conducted visual inspection and evaluation of general and local ventilation systems.

Intertek Testing Services, Cortland, NY - Sampled and evaluated worker exposure to silica dust and respirable particulate associated with filter test activities in 1999.

Alcan Rolled Products, Oswego, NY - Sampled and evaluated worker exposure to metal dusts and solvents associated with metal working operations.

Homogenous Metals, Inc, Clayville, NY - Sampled and evaluated worker exposure to various solvents, metal dusts/fumes, volatile organic chemicals, diisocyanates, silica dusts, inorgancic acids, acids, methylene chloride, and hydroquinone associated with metal production processes. Conducted visual inspection and evaluation of local ventilation systems.

Oneida Foundaries, Inc., NY – Sampled and evaluated worker exposure to silica dust and respirable particulate associated with filter test activities in 1999.

Penn Traffic Co., NY- Sampled for various solvents and evaluated worker exposure associated with silk screening processes. Performed velocity measurements on local exhaust systems.

Hayner Hoyt Inc., NY – Sampled and evaluated worker exposure to silica dust and respirable particulate associated with construction site masonry activities in 1999.

United States Postal Service – Sampled and evaluated worker exposure to asbestos associated with brake pad maintenance.

Indoor Air Quality Assessments

United Way, NY – Conducted and indoor air quality investigation and a comprehensive air sampling program over a one 8-hr work day. Evaluated the ventilation system by sampling carbon dioxide, carbon monoxide, temperature, and relative humidity and visually inspected the general ventilation system. Conducted air sampling for airborne fungi levels and performed a preliminary chemical evaluation.

P.E.A.C.E. Inc. – Designed and conducted an indoor air quality investigation and a comprehensive air sampling program over a one 8-hr work day. Evaluated the ventilation system by sampling carbon dioxide, carbon monoxide, temperature, and humidity and visually inspecting the general ventilation system. Conducted air sampling for airborne fungi levels and performed a preliminary chemical evaluation. Also sampled for volatile organic compounds.

Time Warner Cable, NY – Conducted an indoor air quality investigation and a comprehensive air sampling program over a one 8-hr work day. Evaluated the ventilation system by sampling carbon dioxide, carbon monoxide, temperature, and humidity and visually inspecting the general ventilation system. Conducted air sampling for airborne fungi levels and performed a preliminary chemical evaluation.

Deluxe Financial Services, NY - Conducted an indoor air quality investigation and a comprehensive air sampling program over a one 8-hr work day. Evaluated the ventilation system by sampling carbon dioxide, carbon monoxide, temperature, and humidity and visually inspecting the general ventilation system. Conducted air sampling for airborne fungi levels and a preliminary chemical evaluation.

Clarkson University, NY- Conducted an indoor air quality investigation and air sampling program over three week period. Evaluated the ventilation system by sampling carbon dioxide, carbon monoxide, temperature, and humidity and visually inspecting the general ventilation system. Conducted and evaluated air sampling for volatile organic chemicals (VOCs) in accordance with the appropriate

NIOSH analytical method. Conducted employee interviews to obtain information regarding the quality of the air. Conducted a preliminary chemical evaluation.

Syracuse City School District, NY - Assisted in designing comprehensive air sampling and bulk sampling program for airborne fungi measurements. Conducted air sampling for airborne fungi and through inspections of classroom conditions, materials, and furnishings.

Jordan Elbridge Central Schools, NY - Conducted indoor air quality investigations and comprehensive air sampling programs in 1999 for fungi at two district school buildings. Evaluated the ventilation system by sampling carbon dioxide, carbon monoxide, temperature, humidity and particulate levels, visually inspecting the ventilation system. Conducted a preliminary chemical evaluation.

Dwight Industrial Office Park, NY - Assisted in designing comprehensive air sampling programs for airborne fungi measurements. Conducted air sampling for airborne fungi and through inspections of classroom conditions, materials, and furnishings.

<u>Noise Monitoring</u>

Carrier Corporation- Conducted instantaneous sound level measurements to evaluate worker exposure to noise associated with various production lines within Carrier facilities. Results were compared to OSHA 8-hr TWA-PEL standard and American Conference of Governmental Industrial Hygienist (ACGIH) guidelines.

Clarkson University - Conducted instantaneous sound level measurements over the duration of one, 8-hr day to evaluate worker exposure to noise associated with Clarkson's Department of Buildings and Grounds activities. Personnel noise dosimeters were placed on employees to obtain representative samples of worker noise exposures. Results were compared to the applicable OSHA standards and ACGIH guidelines.

<u>Water Quality Sampling</u>

Deluxe Financial Services, NY - Sampled drinking water for lead, and fecal coliform from drinking fountains and ice machines located in the office complex for compliance with the N.Y.S. Drinking Water Standard.

<u>Ambient air monitoring</u>

Mill Seat Landfill, NY – Performed sampling for NO_X, SO_2, TCE, PCE, asbestos, lead, Ozone, and other compounds using Suma canisters, Ozone analyzers, NO_X, and SO_2 analyzers, and various other industrial hygiene equipment. Was responsible to aid in equipment preparation, calibration, set up, and weather tracking.

ASBESTOS EVALUATION/REMEDIATION:

Air Sampling Technician

Performs asbestos inspections and air sampling of areas scheduled for renovation and demolition. Projects include the removal of friable and non-friable asbestos-containing materials such as the following: floor tile, ceiling tile, transit siding and fume hoods, roofing and flashing materials, boiler and piping insulation and thermal system insulation and contaminated ductwork.

Coordinates project work schedule with the contractor(s) or owner(s) and maintains chain-of-custody documentation throughout sample analysis.

Performs air sampling during asbestos projects for Phase Contrast Microscopy (PCM) analysis and Transmission Electron Microscopy (TEM) analysis and bulk sampling for Polarographic Light Microscopy (PLM) analysis.

Project Monitoring/Inspection

Conducted on-site observation of asbestos removal, remediation and construction repair work to determine compliance with contract documents and appropriate state and federal requirements.

Recommends response actions for materials and procedures which could have potential impacts on worker safety and employee health.

A select list of clients for which project monitoring/inspection and air sampling was conducted in accordance with Industrial Code Rule No. 56 of the N.S. Dept. of Labor, Occupational Safety & Health Administration (OSHA), and US Environmental Protection Agency (USEPA):

Central Square Central School District
Cicero-North Syracuse Central School District
Utica County Court House/Office Buildings
United Helpers Nursing Home
Herkimer County
Albion Central School District
Baldwinsville Central School District
Parishville-Hopkinton Central School District
Reynolds Metals, Inc.
Alcoa
James Jordan Associates
King & King Architects
OP-TECH Environmental Services, Inc.
United States Postal Service
GE Corporate Training Facility

South Cayuga Central School District

Experience Prior to O'Brien & Gere Engineers, Inc.

Industrial Hygiene Technician. Responsible for asbestos air monitoring in accordance with Industrial Code Rule No. 56 of the N.Y.S Department of Labor, Occupational Safety & Health Administration (OSHA), and US Environmental Protection Agency (USEPA). Responsible for lead air sampling in accordance with National Institute for Occupational Safety and Health (NIOSH) methods. Provided OSHA training for sampling methodology and confined spaces. Assisted in the preparation of asbestos samples for analysis by phase contrast microscopy. Interact with and assist other professional staff in providing recommendations for sampling procedures and various industrial hygiene equipment.

Performed fit testing activities in accordance with the appropriate federal methods.

PROFESSIONAL AFFILIATIONS

American Industrial Hygiene Association Central NY Chapter

SPECIAL TRAINING

N.Y.S. Dept. of Health Certification-Asbestos Project Monitor, and Air Sampling Technician

Niagara Mohawk Nuclear Power Plant trained Radiological Worker